Draft Environmental Assessment

Elkhorn Goldfields, Inc.
Golden Dream Mine Project
Operating Permit Application No. 173
Elkhorn, Montana

MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY
ENVIRONMENTAL MANAGEMENT BUREAU

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<u>Glossary of Terms</u>

10-year, 24-hour precipitation event: a storm of significant intensity and duration that has a probability of occurring once every ten years; may actually occur more or less frequently; used as reasonable design criteria for storm water management structures

acre-foot: the volume of water that would cover one acre of land at a depth of one foot; about 326,000 gallons

country rock: rock surrounding the ore body

crown pillar: a body of rock at the top of a mine opening left to support the rock above and to the sides

decibels (dB): a unit for measuring sound; the "A-weighted" noise levels (dBA) closely correspond to the frequencies detected by the human ear, and most useful scale for determining a person's response to noise

decline: a downward-sloping underground opening for access to the workings

drift: horizontal tunnel, excavation, or cut parallel to the ore body

endoskarn: see **skarn**

ephemeral drainage: a gulch or coulee that contains flowing water only part of the year or only during "wet" years; sometimes referred to as an intermittent drainage

equigranular: rock contains grains all about the same size

escape shafts: vertical or inclined tunnels that permit personnel egress

exoskarn: see **skarn**

fracture sets: parallel groupings of fractures

freeboard: additional available space in a pond to prevent overfilling and overflowing

heterogeneous: inconsistent composition or structure; having properties that change throughout the unit

homogeneous: alike, consistent composition or structure; properties do not change throughout the unit

hydric soil: a soil that is saturated, flooded, or ponded by water long enough during the growing season to develop anaerobic (oxygen depleted) conditions; used as an indicator of wetlands

hydrophytic vegetation: plant-life that thrives in wet conditions; used as an indicator of wetlands

igneous: rocks that have crystallized from magma (previously melted rock);

igneous intrusion: rocks that were previously melted, then squeezed into and between (intruded) layers of country rock before crystallizing; the heat and fluids from an igneous intrusion can cause country rock to become metamorphosed

isolates: a cultural resource location

isopluvial: lines of equal precipitation shown on a map

keying: technique used to secure a liner; consists of digging a trench, inserting the edge of the liner, then filling the trench with soil to hold the liner in place

lithic scatters: archaeological sites that consist solely of flaked stone artifacts

lithology or **lithologies:** rock type or types

marble: a metamorphic rock composed of calcium and/or magnesium carbonate; has chemical properties that allow it to neutralize acid

massive: thick units of homogeneous (alike; consistent) material

metamorphism: pre-existing rock that has undergone change due to heat, pressure, or chemically active fluids over time; can be caused by an igneous intrusion

muck bays: expanded underground openings where broken ore can be collected

nugget effect: over-representation or bias in a test result occurring from a “nugget” or otherwise unrepresentatively large concentration of a particular constituent

ore: rock that contains an amount of mineralization that is sufficient to be produced at a profit

outcrops: locations where bedrock protrudes from beneath soil

oxidation: alteration of a rock by the addition of oxygen

oxide: mineral group that contains oxygen

potentiometric surface map: a map that indicates the distribution of groundwater heads and direction of groundwater flow; useful for describing the effects of pumping on an aquifer; indicates where ground water recharges (water enters the subsurface) and discharges (groundwater leaves the subsurface)

Pyrite: an iron sulfide mineral that, when exposed to the atmosphere, is capable of generating acid

Pyrrhotite: an iron sulfide mineral with varying iron content that, when exposed to the atmosphere, is capable of generating acid

rock competency: structural quality or coherence

roof bolts: steel supporting bolts drilled into rock

sedimentary rock: rocks formed from fragments of other rock (sediment) that are transported, deposited, and lithified (compressed and cemented or formed into rock); can also be rock that precipitates from sea water or forms from corals

skarn: a rock modified by the addition of silica, iron, and other compounds in the contact zone between an igneous intrusion and a preexisting rock; **endoskarn** forms in igneous rock, and **exoskarn** forms in sedimentary rocks, particularly carbonates; may contain ore minerals

spillway: engineered location where water is directed to flow out of a pond in the event that the pond is overfilled

static water level: the non-pumping level of ground water

stope: opening excavated for the purpose of removing ore

strike: direction from north of the ore body or other rock unit

subsidence: settling or collapse of the ground surface

sulfide: mineral group that contains sulfur; may include pyrite, pyrrhotite, or other potentially acid generating minerals

ventilation shafts: vertical or inclined tunnels that permit the exchange of fresh air with the underground workings

weathering: the natural alteration of rock that occurs as a result of exposure to the atmosphere

List of Acronyms

ABA: Acid-Base Accounting is the balance between the acid production and acid consumption properties of a mine-waste material. Acid is detrimental to water quality by leaching metals from material into the environment.

ac: Acre; a land measure currently based on the U.S. survey foot, one acre is approximately 43,560 square feet or 4,046.873 square meters.

ASTM: American Society for Testing Materials, founded in 1898, the non-profit organization provides a global forum for the development and publication of voluntary consensus standards for materials, products, systems, and services.

cfs: cubic foot per second is an Imperial unit/U.S. customary unit volumetric flow rate, which is equivalent to a volume of 1 cubic foot flowing every second.

dBA: decibels; a logarithmic unit of measurement used to measure sound on the A-weighted scale.

DEQ: Department of Environmental Quality

ΔP: differential pressure.

DNRC: Department of Natural Resources and Conservation.

ft^2: square foot; a measure of area.

ft^3: cubic foot; a measure of volume.

gpm: gallons per minute.

GWIC: Bureau of Mines and Geology Ground Water Information Center.

HDPE: High Density Polyethylene.

KW: kilowatt

LAD: Land application disposal; refers to disposal method for produced water.

lcy: loose cubic yards; refers to excavated volumes, primarily of soil.

MA: Millions of Years

mg/L: milligram per liter; approximately equal to parts per million (ppm).

MSHA: Mine Safety and Health Administration

MSL: mean sea level

MTMI: Montana Tunnels Mining Inc.

MWMP: Meteoric Water Mobility Procedure; a static chemical analysis used to predict the likelihood that metals will leach from rock exposed to atmospheric conditions.

NNE: North by North East

NNP: Net Neutralization Potential; a measure of the acid consumption properties of a mine waste material.

NOAA: National Oceanic and Atmospheric Administration

NTU: Nephelometric turbidity units; indicates clarity of water

ppb: part per billion; approximately equal to micrograms per liter (μg/L)

RQD: rock quality designation; one of many geotechnical measures of the strength of cored rock

SC values: Specific conductance values; an electrical measure of the amount of dissolved substances in water

SHPO: State Historic Preservation Office

SP: spring

SSW: South by South West

SWPPP: Storm Water Pollution Prevention Plan

TDS: Total dissolved solids; a measure of the amount of dissolved substances in water

TKN: Total Kjeldahl nitrogen; an analytical test that measures all forms of nitrogen in waste water

TSS: Total suspended solids; a measure of the amount of solids suspended in the water column

μg/L: micrograms per liter; approximately equal to part per billion (ppb)

USFS: United States Forest Service

yd^3: cubic yard; a measure of volume.

1.0 INTRODUCTION

In April 2007, Elkhorn Goldfields Inc. (EGI) submitted an Operating Permit application for the Golden Dream Mine Project (aka Elkhorn Project) located 19 miles east of Boulder, Montana (Figure 1). The project site is in Jefferson County, north of the old mining town of Elkhorn, in portions of Sections 10, 11, 14, and 15 in Township 6 North, Range 3 West, and encompasses a proposed total permit area of 382.5 acres. The purpose of the project is to mine gold ore bodies located by exploration drilling. The mine would be developed on privately held claims and on unpatented mining claims within the Deer Lodge National Forest. Surface mine facilities would be located on privately held claims. Impacts to federally administered property would be limited to four short segments of an existing United States Forest Service (USFS) road. Approximately 1,200 feet of this road would be used to access the mine (Elkhorn Goldfields 2007). A Road Use Permit and a fencing agreement are in place for the use of this road and are on file at the Jefferson Ranger District.

The Montana Department of Environmental Quality (DEQ) has jurisdiction to authorize and regulate the Golden Dream Mine Project under the Metal Mine Reclamation Act (MMRA) Title 82, Chapter 4, Part 3 of the Montana Code Annotated (MCA). As part of its review of the operating permit application, DEQ is required to conduct an environmental review pursuant to the Montana Environmental Policy Act (MEPA)) Title 75, Chapter 1, Part 2, MCA. This draft Environmental Assessment (EA) analyzes impacts of permitting the Golden Dream Mine Project as the Proposed Action.

Some of the infrastructure required for the Proposed Action has been previously permitted under Exploration License #00617 (Elkhorn Goldfields 2006).

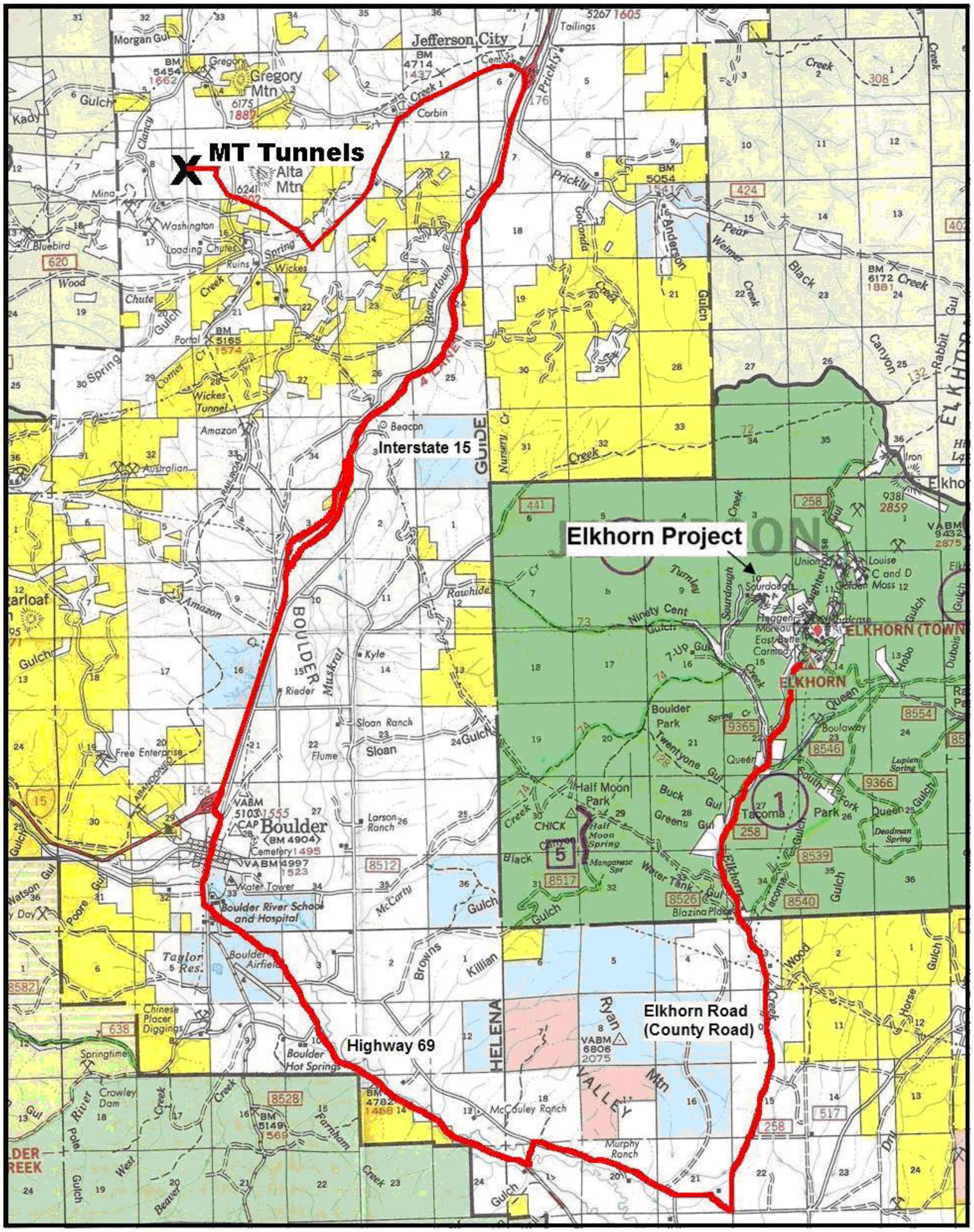
Figure 1 shows the project location and the potential haul route for ore trucks to the Montana Tunnels Mine.

1.1 PURPOSE AND BENEFITS OF THE PROPOSED ACTION

EGI proposes to conduct underground mining operations at the Golden Dream Mine Project near the old mining town of Elkhorn in Jefferson County. Gold makes up 90% of the economic value of the Golden Dream ore, with a small percentage of copper, silver, and other metals.

The Proposed Action would produce gold and provide jobs for up to 70 employees. The gold produced would be used in a variety of industrial and commercial applications. Gold is used in electronics, jewelry and dentistry as it has good resistance to oxidative corrosion which makes it the metal of choice for these applications.

Figure 1- Location of the Golden Dream Mine Project (aka Elkhorn Project), and Potential Haul Route



Source: Elkhorn Goldfields 2007

Green = Forest Service land, yellow = BLM land, blue = State land, pink = Bureau of Reclamation land, and white = private property.

1.2 AUTHORIZING ACTIONS

The DEQ is responsible for permitting mines under the MMRA. Under the MMRA, operating permit applications may be approved by DEQ only after a review of the application, which contains a complete operating plan, reclamation plan, and closure plan and after environmental analysis is completed in compliance with the MEPA.

DEQ is also responsible for protecting air quality under the Clean Air Act of Montana, and water quality under the Montana Water Quality Act. The options that DEQ has for decision-making upon completion of the EA are (1) denying the application, analyzed as the No Action Alternative in this EA, if the proposed operation would violate MMRA, the Clean Air Act, or the Water Quality Act; (2) approving EGI's application as submitted, analyzed as the Proposed Action; 3) approving the application with agency modifications; or 4) determining the need for further environmental analysis to disclose and analyze potentially significant environmental impacts.

DEQ is responsible for calculating the amount of performance bond for reclamation of the Golden Dream Mine. The purpose of the bond is to ensure the fulfillment of obligations under the MMRA and rules implementing MMRA by ensuring the availability of funds sufficient to perform reclamation in the event of default by the operator. The posting of the performance bond payable to the State of Montana is a precondition to issuance of an operating permit. The amount of the bond is based upon the estimated cost to the state of reclaiming the disturbed land under the MMRA, and ensuing compliance with the Clean Air Act of Montana and the Montana Water Quality Act (82-4-123, 223, 226, 332, 338 and 433, MCA; ARM 26.4.1102). The DEQ is required to thoroughly review the bond every five years under MMRA (82-4-338, MCA).

If an operating permit is issued by the DEQ, then the Golden Dream Mine would be subject to safety regulations enforced by the Mine Safety and Health Administration (MSHA). MSHA regulates human health and safety practices under the Federal Mine Safety and Health Act of 1977. The purpose of these standards is the protection of life, promotion of health and safety, and prevention of accidents. MSHA regulations are codified under 30 CFR sub-chapter N, part 56.

1.3 PUBLIC SCOPING

DEQ published a request for public comments on EGI's proposed underground gold mine on May 17, 2007. Seven comments were received from the public. The comments received concerned the increased traffic and road use as well as water concerns.

As part of EGI's commitment to public involvement, public meetings have been held monthly since July 2007 between EGI, local community leaders, and the general public in Boulder, Montana (Table 1). These meetings are meant to inform the communities of Boulder and Elkhorn of the permitting process and to provide opportunity for input on Golden Dream Mine planning and development. The local community stakeholder group has been called the Elkhorn Mine Community Group (EMCG). Its purpose is to provide a communications conduit between the mine leadership and local area stakeholders. The full minutes of these meetings can viewed at www.jeffco.com under the Business banner, then click on JLDC (Jefferson Local Development Corporation).

Table 1 summarizes comments received by DEQ as well as those raised in the EMCG public meetings.

Table 1- Elkhorn Goldfields Public Scoping

ISSUE RAISED	COMMENTS FROM PUBLIC MEETINGS	SECTION ADDRESSED
Road widening	Road would need to be widened to 24 feet.	Section 2.2.4
Vehicle pullouts before bridges	Vehicle pullouts would be constructed before bridges.	Section 2.2.4
Dust control	Dust would need to be controlled using an environmentally safe dust control agent.	Section 2.2.4
Brush removal for visibility	Brush removal would be performed.	Section 2.2.4
Employee transport to mine	Employees would be transported to mine to reduce traffic.	Section 2.2.4
Pilot car option for haul trucks	Pilot car option would remain in case of safety concerns.	Section 2.2.4
Speed limit	Speed limit would be established at 25 mph.	Section 2.2.4
Possible local well water impacts due to dewatering plan of mine.	Baseline well measurements need to be performed on surrounding area wells (Figure 14). A well agreement needs to be written in case of impact to local wells that addresses specific responsibilities and commitments. EGI can supplement Elkhorn's fire fighting capabilities with a water truck and well access located on EGI property.	Section 2.2.8

2.0 PROPOSED ACTION AND ALTERNATIVES

The Golden Dream Mine is located in the historic Elkhorn Mining District (Elkhorn District). The Elkhorn District has a history of mining dating back to the 1870s when silver was discovered on the Holter Lode Claim (Roby et. al. 1960) at the north end of the Elkhorn town site. The town of Elkhorn was established to service the mine and during its peak the town's population reached over 1,000 people. Elkhorn currently has a few residences with the majority of those being seasonal. In addition to silver mining, several gold mines were active during the early history of the District, including the East Butte Area, the Carmody Area, the Sourdough Area, and the Montana Claim. Many mine disturbances including adits, rock dumps, tailings and prospects are common throughout the mining District. Figure 2 depicts some of the major mine disturbances in the project area.

The most recent important mining activity occurred in the 1980s when Mount Heagan Development Company operated a small scale cyanide heap leach operation under Operating

Permit #00128 permitted by the Montana Department of State Lands (MDSL), the predecessor of DEQ. This operation is reclaimed except for the Mount Heagan Pit.

In the 1980s, modern exploration began in the Elkhorn District when Gold Fields Mining Corporation initiated a drill program concentrating on the various gold mines and prospects in the District. Their drilling identified several areas of gold skarn mineralization including significant deposits in the Sourdough/Golden Dream Area, Mount Heagan/Gold Hill Area, East Butte Area, and the Carmody Area. Gold Fields Mining Corporation and subsequently Santa Fe Pacific Gold Corporation, which inherited the property through a series of exchanges, examined several alternatives for mining the deposit and had concentrated on a combination of three open pits and a small underground program to develop the deposits. Santa Fe Pacific Gold Corporation was in the process of developing this alternative when, in 1996, it was purchased by Newmont Mining Corporation, which decided the property did not fulfill its corporate strategy for development projects. Treminco Resources Limited then obtained the property from Newmont Mining Corporation and subsequently became EGI.

Figure 2- Major Past Mining Disturbances

Access Adobe Document

2.1 EXISTING OPERATIONS (THE NO-ACTION ALTERNATIVE)

Under this alternative, EGI would not develop the Golden Dream Mine. In 2001, EGI applied for and received approval for a plan of operations for the "Elkhorn East Butte Mine Exploration and Development Project" (East Butte Plan) from the DEQ under the MMRA Exploration License #00617. This project included drill sampling to locate and describe a potential gold ore body, testing of potential land application disposal (LAD) of captured groundwater, and obtaining an ore sample for mill processing. The disturbance area approved under this plan is 2.5 acres (Figure 3).

In 2006, EGI applied for and received an amendment to Exploration License #00617 for the "Golden Dream Underground Exploration Plan and Bulk Sample Program, Elkhorn Project" (Golden Dream Underground Exploration Plan) (Figure 3). This project further defined the ore body for the Golden Dream Project through sample drilling. A total of 6.9 acres of disturbance was expected under this plan. All the facilities and equipment from the East Butte Plan were approved to be moved to the Saddle Facilities area as part of this amendment.

The following facilities were permitted under the Golden Dream Underground Exploration Plan dated December 2006:

- Office/shop/dry building.
- Outside storage facilities.
- Equipment parking line.
- Employee parking lot.
- Water treatment plant.
- Water distribution center.
- Mount Heagan soil stockpile.
- Development rock stockpile.
- Contingency surge pond for excess water storage.

Under the No Action Alternative, the East Butte and Golden Dream Underground Exploration plans would be maintained and operated by EGI under the existing exploration license. The disturbances associated with each plan would be covered under their various reclamation plans and bonds held with the State of Montana.

Figure 3- Permitted and Proposed Disturbance

Access Adobe Document

2.2 EGI's PROPOSED ACTION

As proposed by EGI in the operating permit application, the Golden Dream Mine Project would consist of a 500 to 1000 tons-per-day mechanized, underground gold mining operation. The ore would be trucked to an offsite mill for concentration. EGI would use the dormant Diamond Hill mill circuit, currently housed at Montana Tunnels Mine near Jefferson City, as a custom mill. The total disturbance acreage for the Golden Dream Project of 29.98 acres has been divided into proposed disturbance and present exploration disturbances under exploration license #00617. As part of the Proposed Action a total permit area of 382.5 acres would be established (Figure 4).

Table 2- Proposed Action Disturbance Acres by Location

AREA	PROPOSED DISTURBANCE (acres)	EXISTING EXPLORATION DISTURBANCE (acres)	TOTAL Acres
Portal Area	-	2.67 GD	2.67
North Portal Area	0.28	-	.28
Saddle Facilities Area	3.82	4.23*GD	8.05
Load Out Area + Core Shed Area	.39	2.5 EB	2.89
Percolation Ponds	1.76	-	1.76
Mine Roads	8.68	-	8.68
Secondary Access Roads	5.21	-	5.21
Sediment Basins	0.44	-	.44
Disturbance Area	**20.58 acres**	**9.4 acres**	**29.98**

Source: Elkhorn Goldfields 2007.

* *1.49 acres are Mount Heagan Pit development rock stockpile*
GD = EGI 2006 Golden Dream Underground Exploration Plan
EB = EGI 2001 East Butte Exploration Plan

The exploration license has approved 9.4 acres of existing disturbance. Approximately 20.58 new acres are planned for disturbance under the Proposed Action. The existing exploration permit disturbances would be incorporated into the Golden Dream Mine operating permit and are evaluated in this EA as part of the Proposed Action disturbance areas.

2.2.1 Soil Salvage and Stockpiling Activities

Prior to any construction on undisturbed ground, soil would be salvaged and stored near the area of origination or at the Saddle Facilities Area in stockpiles for reclamation. The soil would be temporarily seeded for stabilization, to maintain soil properties, and to reduce potential weed infestation. The quantity of soil available for salvage from future proposed disturbance areas is estimated to be 16,350 cubic yards (cy). Additional soil would be hauled to the site if needed to ensure vegetation success in reclaimed areas.

Fine textured soils with less than 30% rock content would be stockpiled separately for use on flatter reclamation areas. Coarse, rocky soils having more than 30% rock content would be used for reclamation of slopes. The annual report submitted to DEQ would include maps that depict locations of all soil stockpiles and record the volume of soil material in each stockpile.

2.2.2 The Proposed Design, Construction, Operation of the Mine and Development Rock Disposal Facilities.

<u>Mine Design and Construction</u>

Figure 4 indicates the locations of all facilities utilized in the Golden Dream Underground Exploration Program and the additions required for the Proposed Action. New construction needed for the Proposed Action includes:

1) An ore loading facility with concrete walls and base pad to prevent infiltration, control runoff, and ease loading procedures.

2) An additional portal (North Portal) for constructing a subsidiary decline on the North Golden Dream ore body.

3) A dewatering well (PW-5) to dewater the North Golden Dream zone, and the piping necessary to transport this water to the treatment area.

4) Addition of a sewage system for gray water and sewage generated from the Office/Dry building.

Figure 4- Proposed Disturbance and Mine Area

Access Adobe Document

Stability

Rock quality data taken from the drill logs suggest that cemented backfill is needed in the upper oxide zones of the ore body. These data show that as mining progresses into the sulfide zones of the ore, the hanging and footwall rock become increasingly competent.

The Proposed Action would institute a surface subsidence monitoring program prior to commencing mining to measure potential movement of the ground surface. This program includes installation of non-movable points on private and USFS land that would be measured and recorded by survey on a quarterly schedule. Four initial points have been identified to start this program. The points are conceptually located over the main decline, ventilation decline, the spiral portion of the decline, and the ore body in the location of the oxide ore zone/crown pillar backfill (Figure 3). Data would be collected, recorded in a database, and analyzed after each surveying event to monitor potential ground movement or surface subsidence.

As development progresses, geologic maps would be drawn that note the location of fractures and fracture sets, rock quality measurements, and the results of roof bolt pull tests. Areas with potential stability issues would be documented and additional engineered support would be installed as necessary.

There are no surface waters or ephemeral (intermittent) drainages above any of the proposed workings that would cause stability issues. Surface water would not run into the mine portals from the surface. Drainage from precipitation and snowmelt would be directed away from the mine openings and report to the sediment control system as outlined in Section 2.2.3.

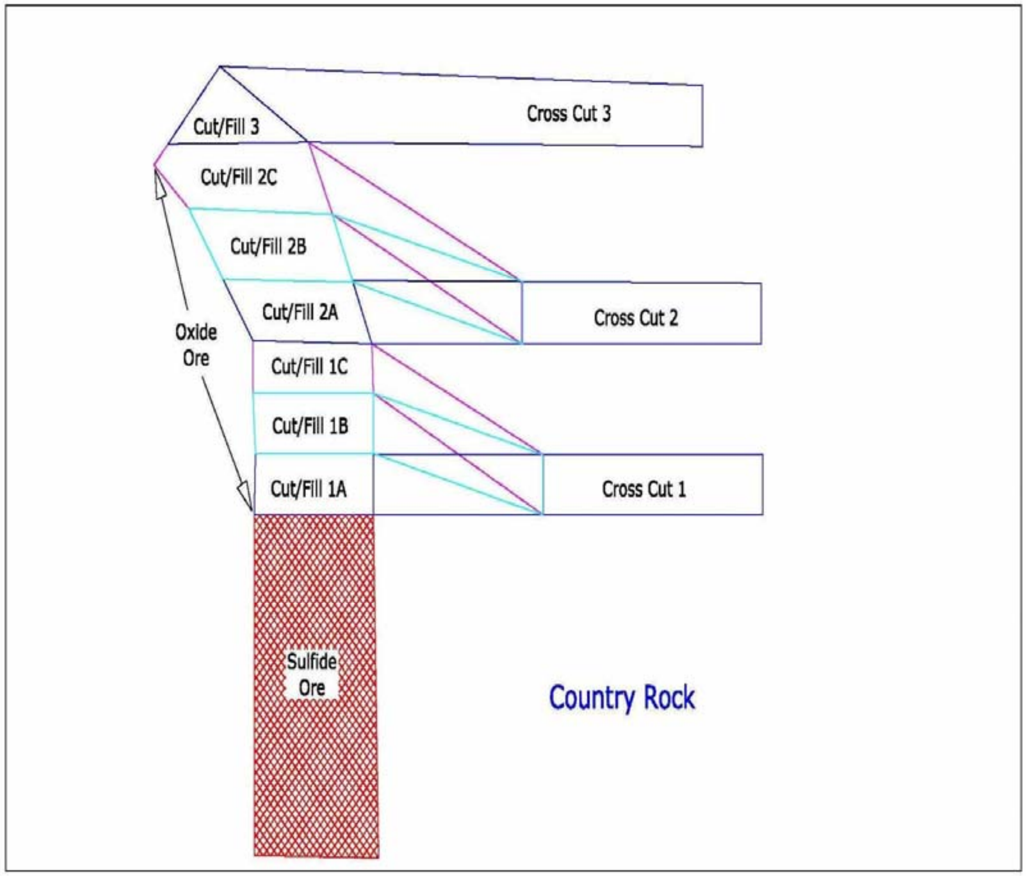
Proposed Mine Operations

The main development decline would be 14 feet wide by 14 feet high with periodic muck bays. Ventilation and escape shafts and access would be built along with the proposed decline. The ore would be accessed every 45 to 60 feet in elevation depending on rock competency.

The Proposed Action would use two extraction methods to remove ore. A cut-and-fill method would be used in the oxide portion of the ore body between the 6,450 and 6,610-foot elevations, depending on the degree of oxidation and the competency of the ore:

- In cut-and-fill mining, ore is mined along strike by driving a drift to remove ore. This cut is then backfilled with cemented fill and another cut in the ore driven alongside or above the backfill (Figure 5). The cemented backfill provides additional support to the country rock. Utilizing this mining method in the oxidized portions of the deposit would provide a stable crown pillar that would not collapse or subside as deeper, sub-level stopes are opened.

Figure 5-Typical Cross-Section Illustrating Cut-and-Fill Mining Method.

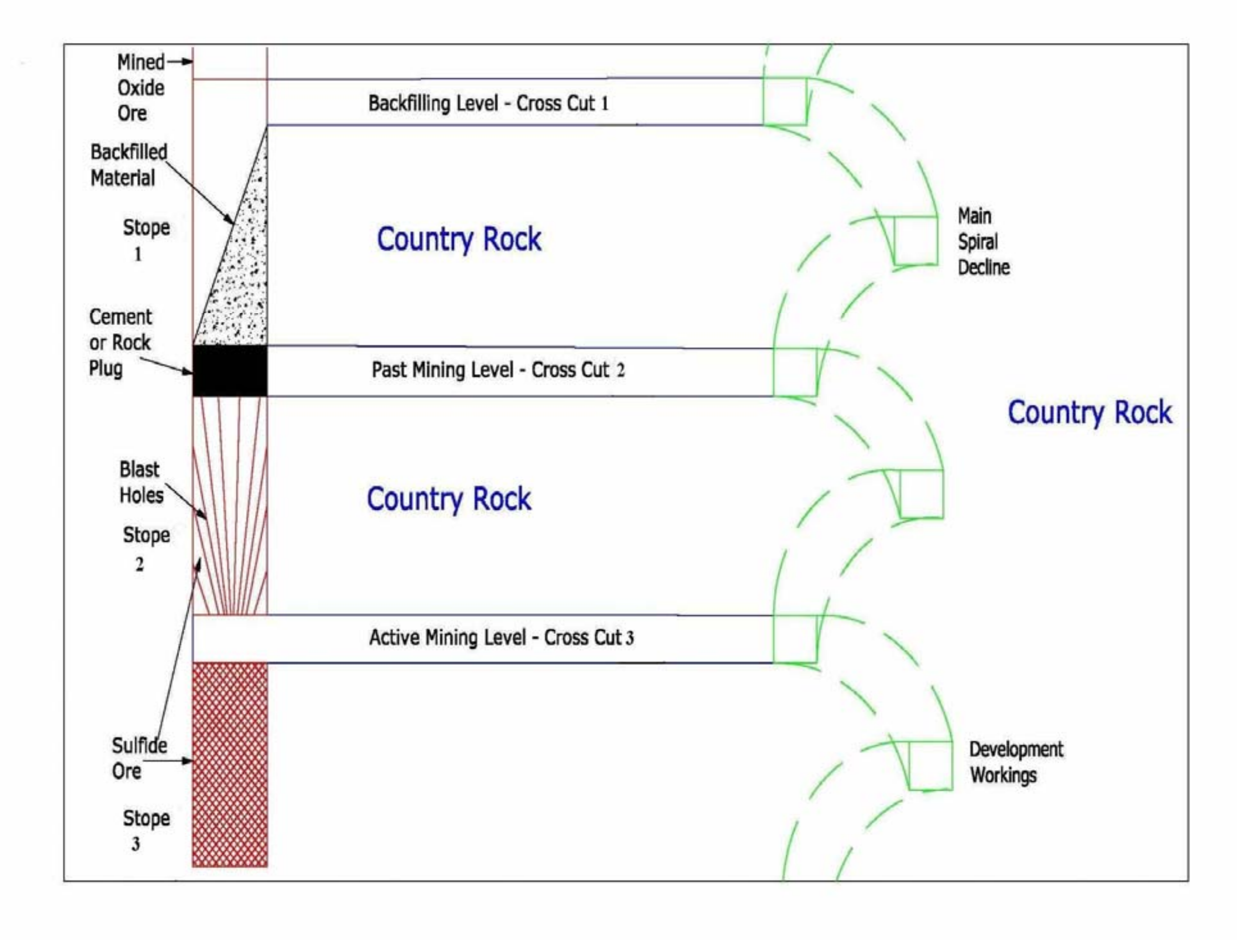


Source: Elkhorn Goldfields 2007.

Based upon exploratory surface drilling results, EGI estimates that below the 6,450-foot elevation, the reduced weathering of the ore body has not negatively affected rock competency and would allow the use of a sub-level stoping mining method.

- In this mining method, two drifts are driven at the top and bottom of a pillar of ore 45 to 60 feet thick (Figure 6). Holes can then be drilled between the two levels and loaded with explosives and the ore blasted out. Open stopes left from this procedure would be backfilled with loose rock or cemented backfill if needed for ground support.

Figure 6- Typical Cross-Section Illustrating Sub-Level Stoping Mining Method.



Source: Elkhorn Goldfields 2007.

2.2.3 Proposed Designs of Sediment/Dewatering Control Structures

Proposed Dewatering Storage Pond

As a contingency for unexpected increases in ground water entering the mine in excess of the capacity of the water treatment system, a Dewatering Storage Pond has been designed at a location near the Saddle Facilities Area (Figure 4).

The pond would contain 1.97 acre-feet of water and have one foot of freeboard. It would be rectangular in shape, 150 feet long, 50 feet wide and 20 feet deep. The sides of the pond would slope 1 horizontal (H):1 vertical (V) leaving the bottom of the pond with dimensions of 110 feet long by 10 feet wide. An industry standard impermeable pond liner would be used to prevent water infiltration into the ground. The liner would cover the bottom and sides of the pond. At the top, the pond liner would be keyed into the bank material to prevent liner slippage and a spillway would be constructed near the top of the pond allowing one foot of freeboard on the pond to ensure pond integrity in case of an unexpected overflow situation. The Dewatering Storage Pond would contain a spillway to protect the pond against washouts during an unexpected overflow. In the event of an overflow, water would follow the natural drainage patterns and infiltrate into the subsurface.

Sediment Basins

Storm water would be managed as described in the Storm Water Pollution Prevention Plan (SWPPP) (Montana Storm Water Permit MTR300264) (Elkhorn Goldfields 2007). The SWPPP provides for protection against erosion and allows monitoring of storm water quality.

Storm water would be captured in sediment basins to collect sediment and allow storm water to infiltrate into the subsurface. Sediment basins constructed for the Golden Dream Mine would be designed to hold storm water runoff from a 10-year, 24-hour precipitation event (up to 2.4 inches of rainfall over a 24-hour period). Storm water data were taken from a NOAA (National Oceanic and Atmospheric Administration) Atlas isopluvial map. The data indicate that the Elkhorn property receives 2.0 to 2.4 inches of rain in a 10-year, 24-hour precipitation event. Infiltration rates and volume calculations were performed for the 2007 Golden Dream Permit Application section 3(g) and will not be detailed here. The description of water flows to the basins and basin size is presented in Table 3. Proposed locations of the basins are shown on Figure 4. Each sediment basin is designed to include 1 foot of freeboard.

Table 3- Sediment Basin Design

Sediment Basin	Estimated Flow per Basin (ft^3)	Sediment Basin Size	
		(ft^3)	(acre-feet)
1	5,852	6,400	0.15
2	10,228	11,200	0.26
3	5,746	6,400	0.15
4	9,268	10,400	0.24
5	8,418	9,000	0.21
6	2,501	2,800	0.06
7	3,409	3,750	0.09
8	5,931	6,400	0.15
9	2,203	2,400	0.06
10	11,596	12,800	0.29
11	3,637	4,000	0.09
12	1,332	1,500	0.03

Source: Elkhorn Goldfields 2007.

Sediment basins would be designed with a spillway to allow for erosion protection in case of overflow. In the event of unexpected overflow, the water would follow natural drainage patterns and infiltrate into the subsurface. Conceptually, a sediment basin spillway would be 10 feet long with a 1 percent slope into the basin and 1H: 1V side slopes. The spillway for each basin would be shaped specific to its location. The spillway would be a plastic lined, 12 inch base by 15 inch deep trapezoidal.

Sediment Basin Sampling

Three sediment basins would capture runoff from mine areas: Basin 2- Portal Area, Basin 4- Mount Heagan Rock Stockpile, and Basin 10- Ore Load-Out Facility (Figure 4). These basins would be plastic-lined to prevent infiltration of runoff potentially contaminated by oil, grease, or metals. Runoff that collects in these lined basins may be used for industrial purposes underground, then treated by the water treatment system (Figure 8). If not used underground, the water collected in these basins would be sampled for contaminants and, if found to be contaminated, hauled by water truck to the water treatment system (Section 2.2.7). If the water does not contain contaminants, it would be allowed to evaporate or be hauled by water truck directly to a percolation pond. Sediment basin sample results would be provided to the DEQ on an annual basis.

2.2.4 Proposed Location of Roads

County Road

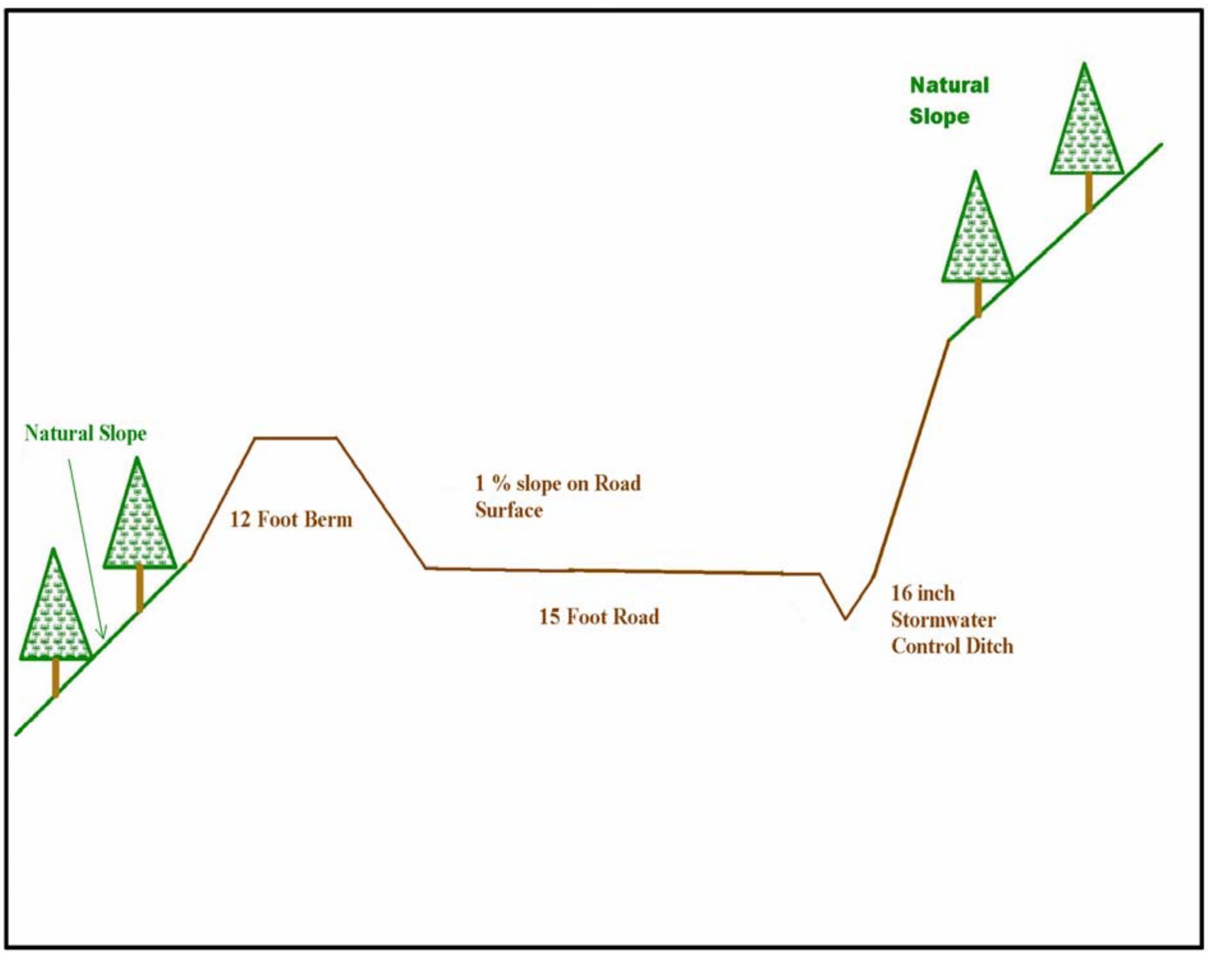
In preparation for the Proposed Action, an agreement was reached between EGI and Jefferson County on the use and maintenance of the Elkhorn County Road for transporting ore (Figure 1). This agreement addresses concerns raised at public scoping meetings conducted by EGI and expressed to DEQ. The road use agreement has been approved by the County Road Supervisor, County Commissioners, and EGI management and is available through Jefferson County or the Operating Permit application (EGI 2007). The contractor to be hired for this work is Bullock Construction of Boulder, MT. The main points of this agreement are:

- Clearing brush along the road for improved visibility.
- Widening the road to 24-foot width including cattle guards and culverts.
- Regrading of the Elkhorn Road and surfacing with appropriate gravel material.
- Posting a speed limit of 25 mph.
- Installing signs, traffic lights, etc. to protect public safety at Point of Rocks, Highway 69, and Elkhorn Road Junction, Queens Siding Corner, and at culverts, cattle guards, and bridges on Elkhorn Road.
- Preventing nuisance dust on the Elkhorn Road by applying an approved dust control agent.
- Regrading at least once a year.
- Hiring a contractor for snow removal.
- Rehabilitating road sections that have deteriorated over the years.
- Returning responsibilities for road maintenance to the County once the mine closes.
- Leaving the road in as good as or better condition as of August 2007.
- Amending this agreement for additional safety concerns due to unforeseen circumstances

Proposed Mine Site Property Main Access Roads

EGI would improve mine security and public safety by restricting public access to the mine by any or all of the following measures: mine personnel, fencing, and gates. Access within the project site would consist of historic roads constructed for mining activities prior to the Proposed Action. To implement the Proposed Action EGI would widen the access roads existing on EGI property (Figure 4) and construct ditches and berms to facilitate safe travel and prevent storm water erosion. Ditches would be designed to contain 2 to 2.4 inches of rainfall, which is the 10-year, 24-hour precipitation event. Ditches would be constructed as a 16-inch-deep "V" cut type ditch (Figure 7) and maintained using surface equipment such as graders. Berms would be constructed as required by MSHA and maintained using the same equipment.

Figure 7- Cross-Section of Typical Mine Road with Stormwater Control Ditches and Berms.



Not to Scale
Source: Elkhorn Goldfields 2007

The road that extends from the county road to the Saddle Facilities Area is on EGI property and is a single travel lane with pullouts large enough for trucks to pass (Figure 4). The road that extends from the Saddle Facilities Area to the portals is constructed as a single lane, one-way loop (Figure 4). Both roads consist of a 15-foot-wide running surface with a 12-foot -wide safety berm. Overall road width is 27 feet. The previous access routes were recontoured and revegetated. After mining, this road would be narrowed to a 10-foot-wide running width and remain for property access.

Proposed Mine Site Property Secondary Administrative Roads

The secondary roads (Figure 4) on the proposed site are included within the calculated disturbance boundary and would be utilized for managing percolation ponds and other mining functions. Traffic on these roads would be restricted to light vehicles and equipment necessary to build, maintain, and reclaim the percolation pond and piping network. These routes already exist as permitted and bonded drilling access roads under the Golden Dream Project Exploration License.

2.2.5 The Source and Volume of Non-Ore Rock.

EGI would construct a decline in the country rock adjoining the ore zone to the 6,410-foot elevation, and a bulk ore sample would be taken at that level. After the bulk sample is processed and the start decision made, ore production would commence. It is anticipated that decline and stope development would proceed downward, while cut-and-fill mining would proceed upward. From the start of development to the 6,410-foot elevation, about 64,000 loose cubic yards (lcy) of non-ore rock would be produced from the decline construction, and placed in the old Mount Heagan Pit. After beginning ore production, an additional 11,000 lcy of non-ore rock would be amended with limestone to neutralize any acid generated, if necessary, and placed in the pit (Figure 4). This volume of 75,000 lcy would be graded and reclaimed to match the existing topography (see Section 2.2.15). Additional rock removed during development would be backfilled into the mined-out underground stopes. Small stockpiles of non-ore rock may be stored on a short-term basis in unused underground workings or on the portal pads prior to use for backfilling (Figure 5 and 6).

Four lithologies (rock types) have been encountered during exploration drilling and would be brought to the surface and used to backfill the Mount Heagan Pit during excavation of the workings. A more detailed description of the lithologies and geology is presented in the operating permit application.

- Diorite – black, equigranular, and fine-to-medium grained igneous rock. This rock would be considered non-ore rock.
- Endoskarn – rock of igneous origin that has been metamorphosed. This rock contains sulfide minerals up to 10 percent or more and can grade into ore.
- Hornfels – high calcium-content sedimentary rocks that have been metamorphosed. Little or no sulfide mineralization is present. This rock would be considered non-ore rock.
- Quartz Monzonite – gray, medium-to-coarse-grained, igneous rock. This rock would be considered non-ore rock.

Below the 6,410-foot elevation almost all of the rock excavated from decline construction is expected to be quartz monzonite. An associate decline on the north zone is expected to be constructed dominantly in marble. As ore is removed from the stopes, development non-ore rock would be used to backfill open stopes. This would eliminate the need to move development non-ore rock to the surface to backfill the Mount Heagan Pit.

Proposed Stockpile Construction

The unreclaimed Mount Heagan Pit is located in the saddle next to the proposed Saddle Facilities Area (Figure 4). The bottom of this pit is barren of most vegetation and has outcrops of marble and pyrrhotite skarn. EGI proposes to remove salvageable soil and backfill the pit with lifts (layers) of non-ore rock. The reclamation plan would be to restore the natural contour, topsoil, and revegetate this area.

2.2.6 The Proposed Chemicals to be Used in the Operation by Location and Task.

Table 4 is a list of chemicals that would be used on-site and shows where they would be stored.

Table 4- On-Site Chemical List

Chemical	Use	Storage Area
Diesel Fuel	Mobile & stationary equipment	Saddle Facilities Area
Explosives	Blasting	Magazines
Lubricants	Equipment maintenance & operations	Saddle Facilities Area
Drilling Fluids	Rock Drilling	Core Shed
Methanol	Nitrate Bioreactor	Saddle Facilities Area

2.2.7 Proposed General Water Use

Proposed Mine Dewatering

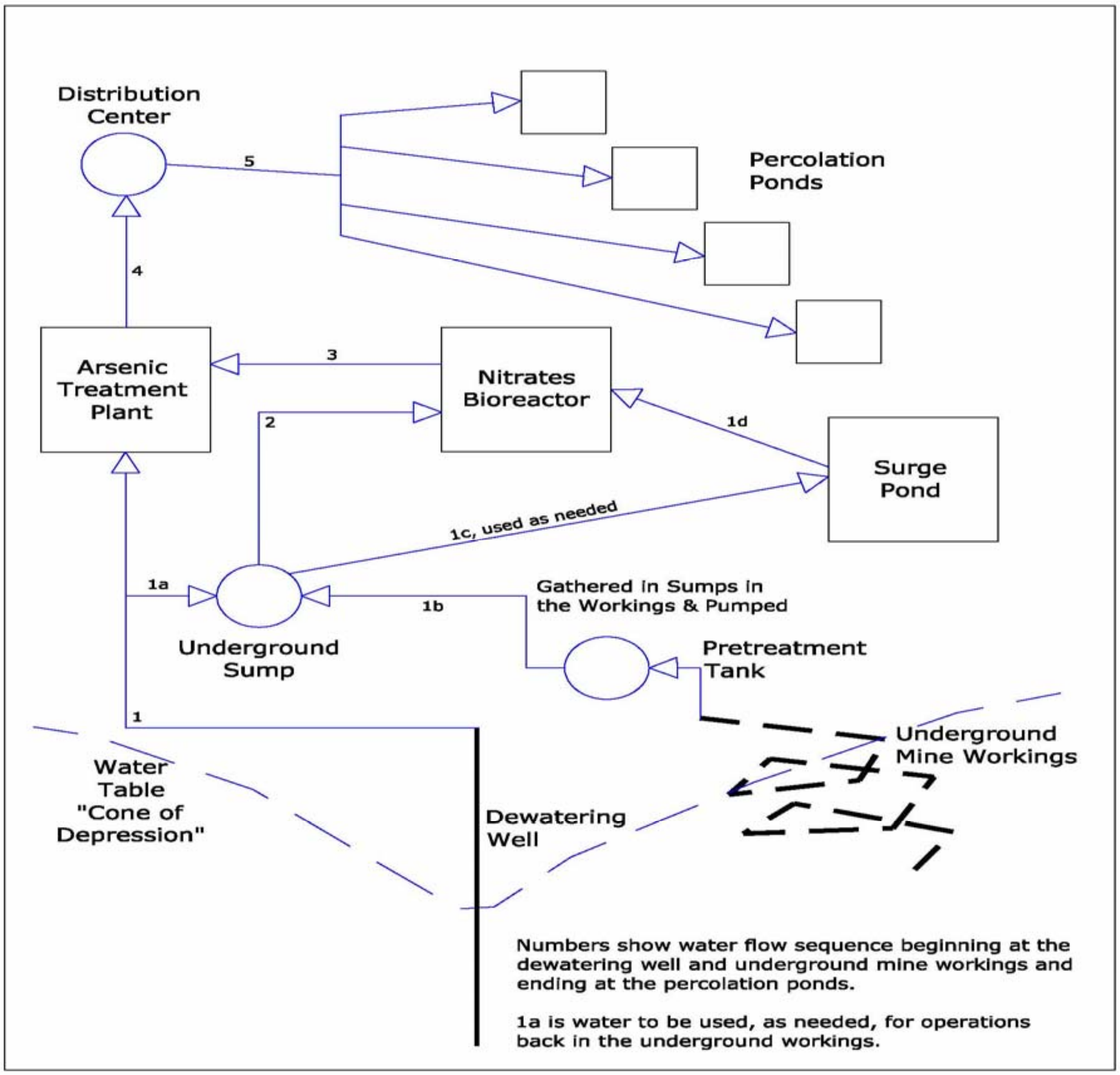
To implement the proposed mining activities, the water table would have to be drawn down below the active mining level. Purge wells (PW-3 and PW-4) were installed to dewater the mine and are located in the Portal Patio Area. In 2005 and 2006, continuous aquifer pumping tests were performed at PW-3 and PW-4 to estimate the dewatering pumping rate needed to implement the Proposed Action. The aquifer tests indicate that pumping from both wells continuously at an average rate of 50 to 100 gallons per minute (gpm), would achieve the drawdown required to dewater and access the ore body during production (Hydrometrics Inc. 2005/2006). Earlier mine dewatering rate estimates ranged from 125 gpm to 175 gpm. An additional well would likely be required to dewater the North Golden Dream ore zone. The proposed location of this well (PW-5) is indicated on Figure 13.

Some water would be used underground for drilling, dust control, muck wash-down, and other production purposes. The rest of the water would report to the distribution center located at the

Saddle Facilities Area for reintroduction to the groundwater through one or more of several percolation ponds located throughout the property (Figures 4 and 8). The quality of water from these wells is generally good with the exception of arsenic, which was found at well PW-3 in concentrations of up to 26 µg/l (micrograms per liter = parts per billion (ppb)). Water pumped from the groundwater aquifer to dewater the mine would be treated to remove arsenic and meet effluent discharge limits prior to discharge to the percolation ponds.

Figure 8 shows the water management sequence for the Golden Dream Project.

Figure 8- Schematic of Water Pumping.



1- Water is collected from the dewatering well and pumped to the arsenic treatment plant.
1a- Water is collected from dewatering wells and pumped to the underground sump for use in mine workings as needed.
1b- Water is collected from mine workings and brought to a pretreatment tank where it is skimmed for hydrocarbons. Then it is pumped to the underground sump.
1c- If needed, excess water would be pumped to the above ground surge pond.
1d- Water collected in the surge pond could then be pumped to the Nitrate Bioreactor.
2- Water collected in the underground sump is pumped to the Nitrate Bioreactor.

3- Water treated for nitrates is pumped to the Arsenic Treatment Plant.
4- Clean water is then pumped to the distribution center.
5- The water is then pumped to the appropriate percolation basins for infiltration back into the groundwater system.

Proposed Water Treatment

EGI proposes to treat the water captured by the dewatering system from the mine workings before it would be reintroduced to the groundwater system. The arsenic treatment system would consist of a skid-mounted system utilizing adsorptive media technology. The medium would be a ferric oxide or ferric hydroxide product that is proven commercially capable of treating arsenic to meet effluent discharge levels. No additional chemicals are required, and when filled the spent medium can be disposed as solid waste. The designed flow-rate for the system would be for a maximum of 300 gpm with an expected average rate of about 150 gpm.

To prevent possible failures of the treatment system due to preferential flow or surface plugging within the treatment chamber, the units would be equipped with differential pressure (ΔP) switches that continuously monitor the fluid pressure drop across the beds over time. The clean bed operating pressure is usually about 10 pounds per square inch (psi). If either adsorber unit exceeds the high ΔP set point (normally 20 psi), that unit would be automatically taken off-line and backwashed. The increased pressure is an indication of clogging from accumulated suspended solids. After the 12-minute backwash, the adsorber is returned to service. The backwash water would be diverted to a storage sump and allowed to settle, be tested, and treated if necessary. During the backwash period, flow would continue through the other "on-line" treatment unit. As part of regular maintenance, the units would be manually taken out of service (one at a time) for backwashing once every 1 to 3 months depending upon the feed water quality to "fluff" or expand the compacted media bed.

In addition to arsenic removal, it is estimated that some nitrate removal may also be required. A nitrate consuming bioreactor would be installed as mining begins. The bioreactor would have the following design characteristics: 20 gallons-per-minute, 50-psi system utilizing two, 2,600-gallon high density polyethylene (HPDE) treatment tanks, plastic media, methanol, and bacterial inoculum.

Nitrate bioreactors have been used successfully to treat up to 1,000 gallons per minute (gpm) and reduce nitrate concentrations from up to 110 mg/l to effluent discharge levels. The Stillwater Mine near Nye, Montana, uses such a system to treat the nitrates contained in captured groundwater. It has proven effective for removing 90 percent of the nitrates from contaminated water at the Nye Stillwater Mine (Reinsel 2005).

Hydrocarbons would also be removed from the water by skimming with oil absorbent materials or other oil-water separation options in the pretreatment tank. Water reporting to percolation ponds as discharge would contain no more than 10 mg/l of hydrocarbons. Sampling for hydrocarbons would be conducted in April and October each year and would be collected at the percolation pond receiving discharge.

Proposed Percolation Ponds

The proposed percolation pond dimensions are about 20 feet by 40 feet and excavated to bedrock. The bottom third of the pond would be filled with washed gravel. A liner would be placed on the sides of the ponds to prevent soil rilling into the pond. Fencing would surround the pond to prevent ingress by either humans or animals. Water would be pumped into the ponds at a rate and for such a time period as needed to let the pond naturally percolate water back into the groundwater system.

The construction sequence for building each pond is as follows:

- The pond would be excavated 20 feet wide by 40 feet long with approximately 1H: 1V side slopes down to bedrock.
- The excavated material would be placed alongside the pond for future reclamation.
- An agency approved plastic liner would be fabricated and welded to fit the pond sides.
- Key cuts, approximately 2 feet deep along the sides of the pond would be created approximately 4 feet back from all edges of the pond.
- The liner would be placed into the pond along the sides and into the key cut, and material would be backfilled on top of the liner to hold the liner in place.
- An egress ditch would be constructed on the uphill corner of each pond to allow wildlife to escape the pond as a contingency.
- Gravel would then be placed in the bottom third of the pond and against the bottom end of the liner to hold the liner in place. This would leave the bottom of the pond unlined for percolation purposes, allowing the liner to prevent rilling of the pond sides or having the percolating water report to the soil layer instead of bedrock.

Estimates of percolation range from 10 to 140 feet per day (40 to 580 gpm) based upon preliminary test pit results. Prior to the initiation of dewatering, EGI would measure the percolation rate at each pond location, calculate the volume of produced water that might be discharged into each pit, and submit those data to the DEQ. At startup, the flow into each pit would be measured and monitored to ensure the pond is operating as designed. Percolation ponds would be completely constructed and tested before the decline encounters groundwater.

Conveyance to the ponds would be a 4- or 6-inch HDPE (high density polyethylene or equivalent) pipe that would be routed to prevent low spots that might freeze and block the system during the winter months. If freezing does occur, one or more of several methods would be utilized to prevent continued occurrence: 1) Heat tape can be installed on the pipe in the dewatering system, 2) water in the system can be heated in tanks before it reaches the piping system ensuring it would not freeze, and 3) the entire piping system can be buried below the frost depth of the soils. EGI staff would determine the best option to utilize based on site-specific conditions.

Water Storage

Should there be a surge in the amount of groundwater inflow, or an isolated, water-filled fracture is intercepted, the mine has the following available storage:

- Dewatering wells can be stopped for a period allowing the aquifer below the workings to recharge (fill) while water is pumped and treated from the workings only.

- Underground sumps required for mining and water control would be available for storage of about 337,500 cubic feet (2.5 million gallons) water.

- The decline can be allowed to flood. Prior to flooding, all equipment and electrical facilities, explosives, etc. would be removed and the workings allowed to flood to the static water level. Depth to static groundwater measured in nearby dewatering test wells was approximately 130 to 160 feet below ground surface or roughly the 6,475-foot level.

The treatment system is designed to accommodate 300 gpm. This rate is well above the expected average inflow and should allow excess water to be treated and disposed in a timely manner. As a contingency, EGI has proposed and designed a surge pond to be located south of the Saddle Facilities Area just below the parking lot. The conceptual volume available for storage volume is 86,000 cubic feet (about 635,000 gallons), which would accept a flow of 500 gpm for 21 hours. This pond is described in Section 2.2.3.

2.2.8 Groundwater and Surface Water Monitoring Programs

Water monitoring would be undertaken to ensure that operations do not negatively impact surrounding waters as defined by the Montana Water Quality Act. The sampling program is divided into two parts:

- Monitoring neighboring surface water and groundwater sites to ensure no mine discharges cause exceedance of water quality standards in the surrounding surface and groundwater.

- Monitoring water quality of groundwater being reintroduced into the regional groundwater system.

Regional sampling during operations would mirror the Baseline Water Resources Sampling and Analysis Plan (Hydrometrics 2007a). When mine dewatering would commence, the sampling program would continue as discussed in the approved baseline plan. Frequencies for surface water and groundwater sites would be increased to semi-monthly for the first three months of pumping and monthly thereafter for the first year. After the first year, sampling would return to the frequency stipulated in the baseline plan, unless directed otherwise by DEQ.

Local Well Levels

In order to address public concerns about possible dewatering of local well water, EGI has committed to monthly sampling of strategic local wells. These levels are being recorded and kept in EGI records and are available to well owners. Baseline water samples would be taken from the wells in the spring of 2008 by a consultant in accordance with the agreements with each well owner. Each agreement would be a separate agreement between EGI and the well owner. All well owners would have access to their well information, and EGI staff would be available to answer questions regarding their wells or the status of their wells (personal communication Shane Parrow, 2008).

Proposed Monitoring of Treated Groundwater

During dewatering operations, regular samples of water from the treatment system would be taken at a location between the treatment system and the distribution system. Initially, samples would be analyzed for a complete parameter list. Subsequent samples would only be analyzed for those elements that exceed or approach state water quality standards. Periodically, samples would continue to be analyzed for the complete parameter list to ensure over time other constituents do not rise to the level of concern.

It is expected that water would be pumped to specific percolation ponds in rotation to ensure no one area would become over-saturated, develop springs downgradient, or cause overland flow. The volume and rate that can be disposed would be determined by the percolation rate at each location. This rate is influenced by physical conditions, such as depth to bedrock and topography. Scheduled visual checks (see Table 5) would be made to determine whether any new springs would develop downgradient from the percolation ponds. Records would be kept indicating when and how often each percolation pond is used and the results of the visual checks.

If a spring or seep does develop, the spring area would immediately be tested to determine if it resulted from percolation. Water sample analysis results would be used as the criteria to determine if springs or seeps are from natural sources or percolation ponds. If test results suggest that percolation is the cause of the spring or seep, use of the pit would be discontinued. If test results suggest that the spring or seep is from natural sources, the spring or seep would be tested quarterly.

The proposed schedule for sampling discharge water from start-up through operations is listed in Table 5.

Table 5- Water Sampling Schedule

Time frame	Complete Parameter List	Elements of Concern List	Visual check Downgradient of Percolation Ponds
Start-up through week one	One on first day, One on day 7	One each day	Once each day
Week two through eight	One each month	One each week	Once each week
Beyond week eight	One each quarter	One each week	Once each month

Additional Monitoring Sites

Three additional monitoring locations would be added to the sampling suite in addition to the monitoring mentioned in the previous sections. First, flumes would be located both upstream and downstream of the mine in Greyback Gulch and used to gather quarterly flow and water quality data. Second, if Observation Well 3 is deemed inadequate, an additional monitoring well would be installed at a depth beneath the mine dewatering level. Third, baseline static water levels and water quality samples would be taken from private wells located in the town of Elkhorn before mining begins. Water levels would also be measured on a monthly basis to establish water level fluctuations in the private wells while the mine is dewatered.

If sediment basins 2, 4, or 10 collect runoff that is not returned to the underground workings for process water, they would be sampled for contaminants. All test results would be provided to the DEQ annually.

Non-Ore Rock Monitoring

In order to ensure that rock encountered during the proposed decline construction matches the predictions of the geochemical characterization, EGI has proposed an operational testing program to monitor the acid generation potential and metal mobility of the produced rock. The data generated by this operational testing program would provide verification of the predicted geochemical character of the rock. This verification program would allow changes to material handling, such as adding limestone amendments to neutralize acid generation, if necessary. Results of the operational testing program would guide mine closure and reclamation bonding decisions.

The overburden rock pile would backfill the Mount Heagan Pit (Figure 10). The Mount Heagan Pit Backfill would contain a small volume of development rock generated during the initial stage of mining and that would be covered with a soil cap. The site would be graded to prevent run-on.

The operational testing program as proposed would consist of the following components.

1. **Data collection concurrent with development rock storage**.
   This sampling would provide EGI the ability to identify potential acid generation or near neutral metals mobility issues as the rock is being placed into the Mount Heagan Pit Backfill and change rock handling procedures if required. For all development rock to be placed in the Mount Heagan Pit storage facility:

   a. Rock samples of the mine face would be taken approximately every 36 feet (or three rounds of advance) except in the quartz monzonite. These samples would be tested utilizing the Modified Sobek Procedure to evaluate acid generation potential (Sobek et. al. 1978).

   b. When mining through the quartz monzonite, each working face would be sampled and analyzed utilizing the Modified Sobek Procedure to evaluate acid generation potential.

c. Additional sample volume of all rock types would be archived for quarterly analysis and compositing.

2. **Quarterly composite sampling:**
   Each quarter, archived samples would be used to create lithology-specific composites that represent each of the four non-ore rock lithologies encountered during that period. It is recommended that diorite, endoskarn, and hornfels composites consist of 8 sub-samples, while the quartz monzonite composite consists of 12 sub-samples.

   a. Quarterly composites would be tested using the Modified Sobek Procedure and Meteoric Water Mobility Procedure so that results can be compared to the baseline evaluation.

   b. If warranted by static test results, composites would be further evaluated using kinetic methods such as the American Society for Testing and Materials (ASTM) humidity cell.

3. **Field-scale barrel tests:**
   For each of the rock types encountered underground, a barrel test would be performed for the duration of mining operations. The test apparatus would consist of a rock-filled drum that is open at the top to allow precipitation to enter, and collects leachate that percolates to the bottom of the drum. The leachate from these barrels would be sampled quarterly for the first year and annually thereafter. If geochemical test results indicate that amendment may be required to prevent acid generation or mobility of metals from the development rock, an additional drum of rock plus amendment would also be tested.

4. **Reporting:**
   The results of the operational testing, as proposed, would be compiled and evaluated annually and reported to the DEQ in the annual report.

The rock generated during the initial phase of development is not anticipated to contain large quantities of leachable metals. If testing or on-site monitoring indicate a potential for poor quality drainage from this rock pile, EGI would implement additional measures as necessary to prevent impacts, which may include encapsulation of non-ore rock beneath a liner.

The mine currently anticipates using LAD on a limited basis to assist in reclamation. Since the treated water would meet water quality standards, there are no specific control measures required for management of the LAD water beyond normal reclamation requirements.

Reporting

Water quality statistics that are required for groundwater permitting evaluation are presented in Table 6. The table compares these data to mean water quality for the regional groundwater system in this area with applicable regulatory limits, including non-degradation standards. Groundwater wells GFMW-3 and GFMW-5 are used as indicators of baseline groundwater quality that is not impacted by EGI's proposed mining activities (Figure 9). Both PW-3 and PW-4 wells have low concentrations of arsenic and metals. Spring SP-1 is located downgradient of the infiltration area and shows total metal concentrations that presently discharge to surface water.

Discharge water quality values listed in Table 6 were compiled from samples collected from the dewatering wells before and after sustained pumping. These results indicate the range in untreated water quality. The comparison in Table 6 shows that the untreated discharge water would meet applicable water quality standards with the possible exception of arsenic. The non-degradation limit for arsenic could be exceeded if no treatment were proposed. Arsenic is listed as a carcinogen, and non-degradation rules allow no increase over background concentrations for carcinogens. With the proposed treatment, arsenic non-degradation limits would not be exceeded. Table 6 indicates that concentrations of antimony and lead are at or below the lowest consistently measurable concentrations, termed method detection limits. Method detection limits are specific to each analysis, and the use of a "<" (less than sign) indicates that the measurable concentration of a parameter was low enough to not be quantifiable. Concentrations below method detection limits are considered equivalent to background water quality values.

Average Receiving Water Quality - Water quality data from two monitoring wells (GFMW-3 and GFMW-5) and one spring (GFSP-1) were used to compile average receiving water quality statistics. The average receiving water quality statistics are based on 15 to 18 water quality samples from each well and three analyses from the downgradient spring GFSP-1. Water quality from the individual wells is very similar. These wells were selected because they were outside historically mined areas and displayed the lowest concentrations of nitrogen and metals. In fact, ambient water quality in much of this area is influenced by mineralization and/or historical mining and is poorer in quality than indicated by these wells. The spring GWSP-1 was included because it is in a relatively undisturbed area downgradient of the proposed infiltration area.

Discharge Water Quality - The PW-3 and PW-4 wells were pumped for several weeks to evaluate aquifer characteristics and collect samples to obtain water quality data. As the length of time the wells were pumped increased, water quality improved and approached regional groundwater quality. The estimate of discharge water quality is conservative because dewatering would occur prior to mining, minimizing the impact of the Proposed Action on the quality of the aquifer.

Table 6 - Water Quality Analysis

Parameter	Average Receiving Water Quality (1)				Discharge Water Quality (2)			Human Health Standards (GW)	Non-Deg limits	Trigger Value	Required Reporting Limits
	Monitoring Well Data (Dissolved)		Spring Data (Total Recoverable)								
Field Measurements	# of Samples	Average	# of Samples	Average	# of Samples	Max	Min				
Water Temp. (C) :	34	8	2	11				---	---	---	---
Field pH (s.u.) :	25	7	2	7				---	---	---	---
Lab pH (s.u.) :	23	7			2	8.1	7.9	---	---	---	---
Field Conductance (umhos/cm) :	18	334	2	332				---	---	---	---
Lab Conductivity (umhos/cm) :	23	303			2	456.0	395.0	---	---	---	---
EH (mv) :	6	220						---	---	---	---
DO:	7	8						---	---	---	---
Solids, Akalinity & Nutrients											
Total Dissolved Solids :	37	207	3	228				---	---	---	---
Carbonate as CO_3 :	34	0.20	3	<1				---	---	---	---
Bicarbonate as HCO_3 :	37	160	3	133	2	250.0	230.0	---	---	---	---
Total Hardness as $CaCO_3$:	27	164	---	---				---	---	---	---
Total Alkalinity as $CaCO_3$:	37	161	3	110	2	200.0	190.0	---	---	---	---
Ammonia :	37	0.07	3	0.05	2	0.1	0.1	---		0.01	0.05
Nitrate + Nitrite as N :	37	0.24	3	0.07	2	1.2	0.4	10.0	7.5	5.0	0.01
Total KJELDAHL Nitrogen :	27	0.21	---	---				---	---	---	---
Orthophosphate :	27	0.03	---	---				---	---	---	---
Total Phosphorus (1):	37	0.04	3	0.02				---		0.001	0.001
Total Suspended Solids :	4	19	3	27				---	---	---	---
Common Ions											
Calcium :	37	44	3	43	2	66	35	---	---	---	---
Magnesium :	37	12	3	10	2	29	18	---	---	---	---

Table 6 - Water Quality Analysis - Continued

Parameter	Average Receiving Water Quality (1)				Discharge Water Quality (2)			Human Health Standards (GW)	Non-Deg limits	Trigger Value	Required Reporting Limits
	Monitoring Well Data (Dissolved)		Spring Data (Total Recoverable)								
Field Measurements	**# of Samples**	**Average**	**# of Samples**	**Average**	**# of Samples**	**Max**	**Min**				
Sodium :	37	6	3	10	2	5	4	---	---	---	---
Potassium :	25	2	3	4	2	2	1	---	---	---	---
Sulfate :	37	37	3	61	2	41	29	---	---	---	---
Chloride :	37	3	3	4	2	5	4	---	---	---	---
Trace Metals											
Aluminum :	33	0.09	3	0.07	1	<0.1	<0.1	---		0.03	0.03
Antimony :	20	<0.004	3	<0.003	3	<0.005	<0.003	0.006	0.0009	0.0004	0.003
Arsenic :	33	0.004	3	0.020	3	0.025	0.008	0.010	no increase	no increase	0.003
Barium :	33	0.08	3	0.01	1	<0.1	<0.1	2	0.3	0.002	0.005
Beryllium :	17	<0.001	3	<0.001	1	<0.001	<0.001	0.004	no increase	no increase	0.001
Boron:	---	---	---	---	1	0.3	0.3	---	---	---	---
Cadmium :	33	<0.0010	3	0.00013	3	<0.0001	<0.0001	0.005	0.0008	0.0001	0.00008
Chromium :	33	<0.008	3	<0.001	1	<0.001	<0.001	0.1		0.001	0.001
Copper :	33	<0.005	3	0.005	3	0.009	0.001	1.3	0.20	0.0005	0.001
Iron (2):	33	0.03	3	1.03	3	0.24	0.02	0.3	---	---	0.05
Lead :	33	<0.005	3	0.004	3	<0.003	<0.003	0.015	0.0023	0.0001	0.0005
Manganese (2):	33	<0.013	3	0.012	3	0.020	<0.005	0.05	---	---	0.005
Mercury :	33	<0.0005	3	<0.0001	1	<0.0001	<0.0001	0.002	no increase	no increase	0.00001
Molybdenum :	33	<0.009	3	0.054	---	---	---	---	---	---	---
Nickel :	31	<0.014	3	<0.005	1	<0.01	<0.01	0.1	0.015	0.0005	0.01
Selenium :	33	<0.003	3	<0.001	3	<0.001	<0.001	0.05	0.0075	0.0006	0.001
Silver :	32	<0.003	3	<0.001	1	<0.005	<0.005	0.1	0.015	0.0002	0.0005
Strontium:	---	---	---	---	1	0.2	0.2	4	0.6	0.1	---

Table 6 - Water Quality Analysis - Continued

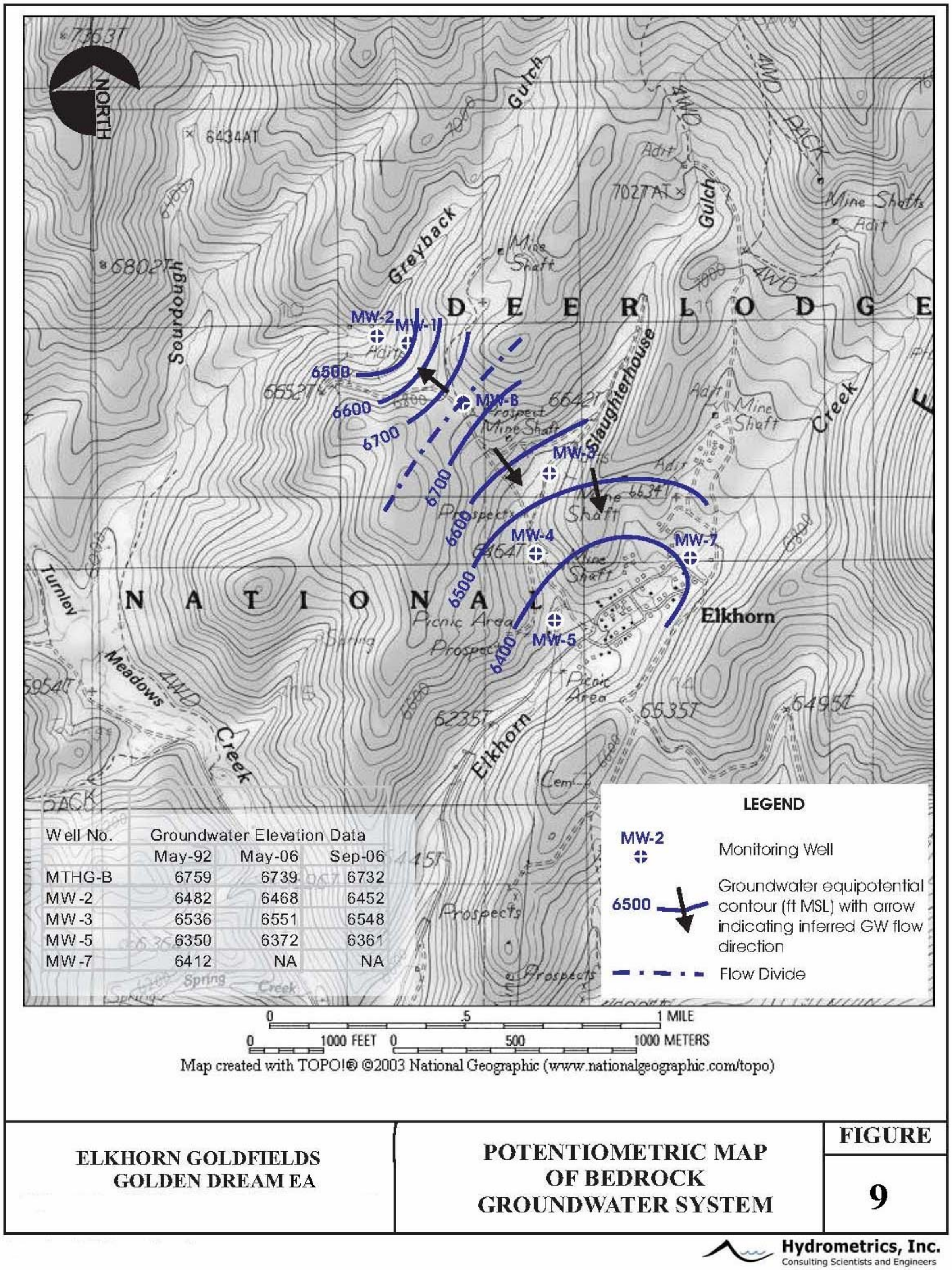
Parameter	Average Receiving Water Quality (1)				Discharge Water Quality (2)			Human Health Standards (GW)	Non-Deg limits	Trigger Value	Required Reporting Limits
	Monitoring Well Data (Dissolved)		Spring Data (Total Recoverable)								
Field Measurements	# of Samples	Average	# of Samples	Average	# of Samples	Max	Min				
Thallium :	20	<0.0014	3	<0.0002	1	<0.001	<0.001	0.002	0.0003	0.0003	0.0002
Zinc :	33	0.038	3	0.017	3	0.22	0.05	2	0.3	0.005	0.01
Notes: <= less then detectable											
All results displayed in mg/L unless otherwise specified.											
Detection limits were used to calculate statistics when the data was below detection.											
1 = Plant nutrient, excessive amounts may cause unwanted aquatic growth and violate ARM 17.30.637(1)(e). Phosphorus standards are applicable to surface water only. Total ammonia standards apply only to surface waters based on protection of aquatic life and vary with presence/absence of fish early life stages, pH, temperature.											
2 Narrative standard (guidance level given based on Secondary Federal Maximum Contaminant Level). There are no nondegradation limits established for narrative standards.											
(1) Source: Average water quality data from monitoring wells GFMW-03 and GFMW-05 (1989 - 2007; Metals - Dissolved), and spring SP-1 (2006 - 2007; Metals - Total Recoverable) as shown in MPDES WQ Eval.xls spreadsheet											
(2) Source: Minimum and maximum water quality data from dewatering wells PW-4 and PW-3 (July 2006), and Pump Well (March 2005) as shown in MPDES WQ Eval.xls											

EGI would provide to DEQ a report compiling all operational water quality monitoring data on the following schedule:

- Start of pumping through week 8: Weekly reports submitted no later than the second business day after completion of the week.
- Week 8 to week 52: Monthly reports submitted no later than the fifth business day of the following month.
- Beyond week 52: Quarterly reports submitted no later than fifth business day of the following quarter.
- Annual reports, due on the anniversary date of permit issuance; EGI would also provide information concerning soils balance/inventory; geotechnical stability over workings; barrel testing results; ore and tailings testing; rock geochemistry; updated potentiometric surface maps; and results of sediment basin sampling.

A potentiometric surface map (indicating the distribution of groundwater heads and direction of flow) for the bedrock groundwater system has been compiled from recent monitoring data (Figure 9). This map would be updated annually and included in the annual report.

Figure 9- Potentiometric Map of Bedrock Groundwater System



2.2.9 Prevention of Environmental Degradation

Provisions for the Prevention of Wind Erosion of All Disturbed Areas

Making use of the natural surroundings of the area, existing trees would be used as wind breaks to prevent wind erosion. All soil disturbed by new construction would be seeded at the first opportunity. All disturbed areas not related to active mining and exploration would be recontoured and reseeded as part of the concurrent reclamation plan.

Damage to Flora and Fauna in or Adjacent Areas

Disturbance would be limited to areas necessary for mining operations as designated on Figure 4. EGI would build a barrier fence to surround active areas and prevent disturbance outside these areas. Employees would be instructed in annual training to avoid unnecessary damage to flora and fauna.

Fire Protection Plan

The underground portion of the mine and surface infrastructure would have a fire prevention and response plan in accordance with MSHA requirements, which includes fire suppression, fire extinguishers, and on-site water trucks. Open flames would not be allowed on the mine site during periods of high fire danger. A burn permit would be obtained before any open burning occurs on the mine site.

Toxic Spill Contingency Plan

A toxic spill prevention plan has been developed and has been provided to the State Fire Marshal.

Sewage Treatment

Sewage and gray water from the office/dry area is to be stored in a holding tank on the property and pumped out utilizing a commercial septic service. As work progresses and employment increases, EGI may establish a regular septic leach system near the Saddle Facilities Area. A licensed contractor with appropriate permits would install the septic leach system as specified by state and county regulations.

In order to monitor the water quality, a monitoring well would be installed 500 feet down gradient from the edge of the leach field. Quarterly water quality data per direction of the DEQ would be collected from this well to ensure all applicable laws and regulations are being followed. In the event that the water quality in this well does not meet water quality standards, EGI would install appropriate treatment equipment to treat the sewage before discharge. The exact location of this well is yet to be determined but would be located only upon DEQ approval.

Solid Waste Disposal

Solid waste would be contained and placed in covered trashcans located throughout the mine site. Mine personnel would empty the trashcans into enclosed dumpsters located at the Saddle Facilities Area on a regular basis. A local contractor would be hired to empty these dumpsters on a regular basis and haul the solid waste to a certified landfill. EGI would install bear proof trash containers on all outdoor locations.

Items such as batteries, lights, used oils, old computers, and anything that cannot report to a standard landfill would be separated from all other trash and stored separately. These materials would be collected by an approved hazardous waste handling company on a regular basis for recycling or proper disposal.

2.2.10 Proposed Power Needs and Sources, Including Fuel Storage Sites

Power

Power would be required at three different locations at the proposed mine site. These locations include the Core Shed Area, the Saddle Facilities Area, and the Portal Patio Area. During exploration, diesel generated power would be used at the site, while the Core Shed Area would continue to use line power that is already in place. Electricity is needed to provide electric heat and power computers and lighting. During exploration, NorthWestern Energy would deliver an upgraded power system and line power to the three locations as well as the town of Elkhorn. In addition to the line power, a small 250-500 kW diesel generator would be maintained on-site for emergencies. This generator would power evacuation and communication systems when line power is not available and would allow water to be pumped and treated. The backup generator would be located in the Office/Shop structure in the Saddle Facilities Area (Figure 4).

EGI would be responsible for posting the reclamation performance bond of the new electrical system within the permit/property boundary, including 13 power poles, a pad mounted transformer, and metering equipment. (Reference Charles Smith, Engineer, NorthWestern Energy, Helena Division).

Fuel Storage

The proposed surface fuel station and fueling area would be constructed as part of the Office/Shop building and would reside on a 60-foot by 180-foot concrete pad. This fuel area would be sloped towards the building for containment purposes. A cement containment sump would be constructed (conceptually 5.5 feet by 12 feet by 60 feet) that would be large enough to contain 110 percent of the fuel tank capacity.

Two 13,000-gallon fuel storage tanks would be stored in the containment sump and monitored visually for leaks and spills. This holding area would be pumped and/or cleaned out after any large spill occurs or on an as needed basis. Disposal of the material pumped from the system would be in accordance to all local, state, and federal regulations, or used on the mine property as an energy source. A cover would be placed over the fuel station to prevent storm water from entering the containment system. The surrounding ground would have a gradual slope away from the fuel station along with berms and/or ditches to prevent storm water run-on.

2.2.11 Proposed Employment Including Direct and On-site Contract Employees

Mine Site:

- Drilling:
  2 employees per shift, two shifts per day, seven days per week (4 crews).

- Development/Production/Maintenance:
  11 employees per shift, two shifts per day, seven days per week (4 crews).

- Construction:
  2 employees per shift, two shifts per day, four days per week (2 crews).

- Facilities/Maintenance:
  2 employees per shift, one shift per day, five days per week (1 crew).

- Staff :
  Exempt – 12 employees per shift, one shift per day, five days per week.

- Ore Processing/Tailings Disposal:
  Would be handled by process facility owner at mill location.

- Total Anticipated Direct Employment:
  70 employees

In addition, EGI would be hiring a full time trucking contractor for hauling ore to the Montana Tunnels mill site (Figure 1). These employees would spend their work day traveling between the Load Out Area and Montana Tunnels. Other temporary contractors would be on-site intermittently as needed.

2.2.12 Proposed Transportation Network

EGI proposes to transport mine employees from a location in the valley to the mine site in light vans or sport utility vehicles. The plan is to reduce traffic on the county road to Elkhorn and increase safety for both mine employees and other road users. On occasion, contract equipment, such as graders, track hoes, and dozers, would be on the mine site for surface maintenance of roadways, stockpile locations, the portal patio, and parking lots. Up to nine 30-ton over-the-road trucks would be hauling ore up to five round trips per day.

2.2.13 Predicted Noise Levels of Proposed Action During Construction and Operations.

Noise is generally defined as unwanted sound and can be intermittent or continuous, steady or impulsive, stationary or transient. Noise levels heard by humans and animals are dependent on several variables, including distance between the source and receiver, altitude, temperature, humidity, wind speed, terrain, and vegetation. Human and animal perception of noise is affected by intensity, frequency, pitch and duration, as well as the auditory system and physiology of the animal. Noise can influence humans or wildlife by interfering with normal activities or diminishing the quality of the environment. Response to noise is subjective; therefore, the perception of noise can vary from person to person or among animals.

Noise levels are quantified using units of decibels (dB). Humans typically have reduced hearing sensitivity at low frequencies compared with their response at high frequencies. The "A-weighting" of noise levels, or A-weighted decibels (dBA), closely correlates to the frequency response of normal human hearing (250 to 4,000 hertz). By using A-weighted noise levels in an environmental study, a person's response to noise can typically be assessed.

Many different A-weighted metrics can be used to describe and quantify noise levels. The equivalent noise level during a certain time period uses a single number to describe the constantly fluctuating instantaneous ambient noise levels at a receptor location during a period of time, and accounts for all noises and quiet periods that occur during that time period.

The day-night average noise level is a single number descriptor that represents the constantly varying sound level during a continuous 24-hour period. This level can be determined using 24 consecutive one–hour noise levels, or estimated using measured noise levels during shorter time periods. The day-night average noise level includes a 10-decibel penalty that is added to noises that occur during the nighttime hours between 10:00 p.m. and 7:00 a.m., to account for people's higher sensitivity to noise at night when the background noise level is typically low. Because it represents the average noise level during a 24-hour period, the day-night average noise level is not effective for describing individual noise events, such as a single blast.

The 90^{th} percentile-exceeded noise level, or ambient level, indicates the single noise level that is exceeded during 90 percent of a measurement period. The ambient noise level is often near the low end of the instantaneous noise levels during a measurement period. It does not typically include the influence of discrete noises of short duration, such as car doors closing, bird chirps, dog barks, or car horns. If a continuously operating piece of equipment is audible at a measurement location, typically it is the noise created by the equipment that determines the ambient level of a measurement period even though other noise sources may be briefly audible and occasionally louder than the equipment during the same measurement period.

Comparing the noise levels of a noise source to ambient noise levels at a listener location helps approximate whether a noise source will be audible. In general, if the noise source value is less than the ambient source value, then the noise would rarely be heard, if at all. If the source is up to 10 dBA higher than the ambient value, then the noise would be audible sometimes, and if the noise source is more than 10 dBA higher than the ambient level, then the noise would be heard often (Menge 2005).

Large amplitude impulsive sounds, such as blasting are commonly defined using the un-weighted instantaneous peak noise level. Peak noise levels represent the highest instantaneous noise level during a certain time period (Personal Communication S. Connolly).

The majority of sound generated from the proposed mining activity would come from the Saddle Facilities Area (approximately 4,000 feet northwest of the town site), the truck loading facility (approximately 1,400 feet northwest of the town site), and over-the-road truck traffic moving along the south boundary of the town site of Elkhorn. The mine portals are north of the Saddle Facilities Area and located over a prominent ridge and face away from the town site of Elkhorn.

Decibel levels may initially be higher due to start up construction, when near surface blasting events would occur at the portals, and from truck travel through the area to the mine. Sound levels generated by the Proposed Action would decrease as the mine develops underground. At that time, the majority of the sound would come from the loading of haul trucks and the trucks passing through the town of Elkhorn.

A baseline sound investigation was conducted for the Elkhorn Project by Hydrometrics, Inc. in 1993. The study indicated that mining processes had a decibel reading on the A scale (dBA) level suitable for an area in and around the town site of Elkhorn. Average mining sound levels in the 40-50 dBA range are below the day-night average noise level protective levels for "wooded residential" settings of 52 dBA and "old urban residential area" settings of 59 dBA.

Noise generated from everyday mine operations is not expected to exceed the 40 – 50 dBA range in the town of Elkhorn. Peak sound events such as blasting at the start of mine development could generate short term noise above the "wooded residential" 52 dBA level. The maximum allowed limit in the town of Elkhorn for any noises created by EGI would be 85 dB. This 85 dBA limit parallels the National Institute of Occupational Safety and Health (NIOSH) recommendations on noise safety levels. Sustained exposure to 85 dBA and higher could cause hearing damage (www.cdc.gov/niosh).

Four separate noise level sampling events would be conducted in the town of Elkhorn before mining begins. As an ongoing program, noise levels would be measured once per month during mining. Construction work would be kept to daylight hours only. Mining would be conducted 24 hours per day, 7 days per week. Possible mining noises heard in the town of Elkhorn could be from operating equipment, including six mine haul trucks, a front end loader, and up to nine over-the-road trucks. Use of engine decompression (jake) brakes would be controlled by speed limits for equipment leaving the property.

2.2.14 Protective Measures for Archaeological and Historical Values

Historical areas of concern would remain in place during the mine life and would not be disturbed. No archaeological sites have been found to date on the mine site's private grounds. Upon discovery of any archaeological items, all activities in the area of the archaeological items would stop until reviewed by the State Historic Preservation Office (SHPO).

2.2.15 Reclamation Plan and Mine Closure

The patented mining claims that comprise EGI property have been most consistently utilized for mineral exploration since the 1980s. The lands have also been used for timber production (logging) and livestock grazing. The area also provides wildlife habitat. The goal of the reclamation plan would be the "return of lands disturbed by mining or mining related activities to an approved post mining land use which has stability and utility comparable to that of the pre-mining landscape"(ARM 17.24.102 (13)).

All proposed disturbed land would be reclaimed as private forest lands as existed before mining activities had commenced. Reclamation regrading of the surface contours would not create topographic lows that would facilitate ponding or areas of saturation.

Reclaimed areas would be covered with one foot of soil. The area would then be seeded and harrowed or raked. Additional organic soil amendments would be hauled as needed from Big Butte Compost in Butte, Montana and delivered to the site by over the road trucks. The soil would be amended until vegetation efforts are successful.

Seeding

Table 7 below specifies the revegetation seed mix that would be utilized for reclamation.

Table 7- Reclamation Seed Mix (Broadcast Rate)

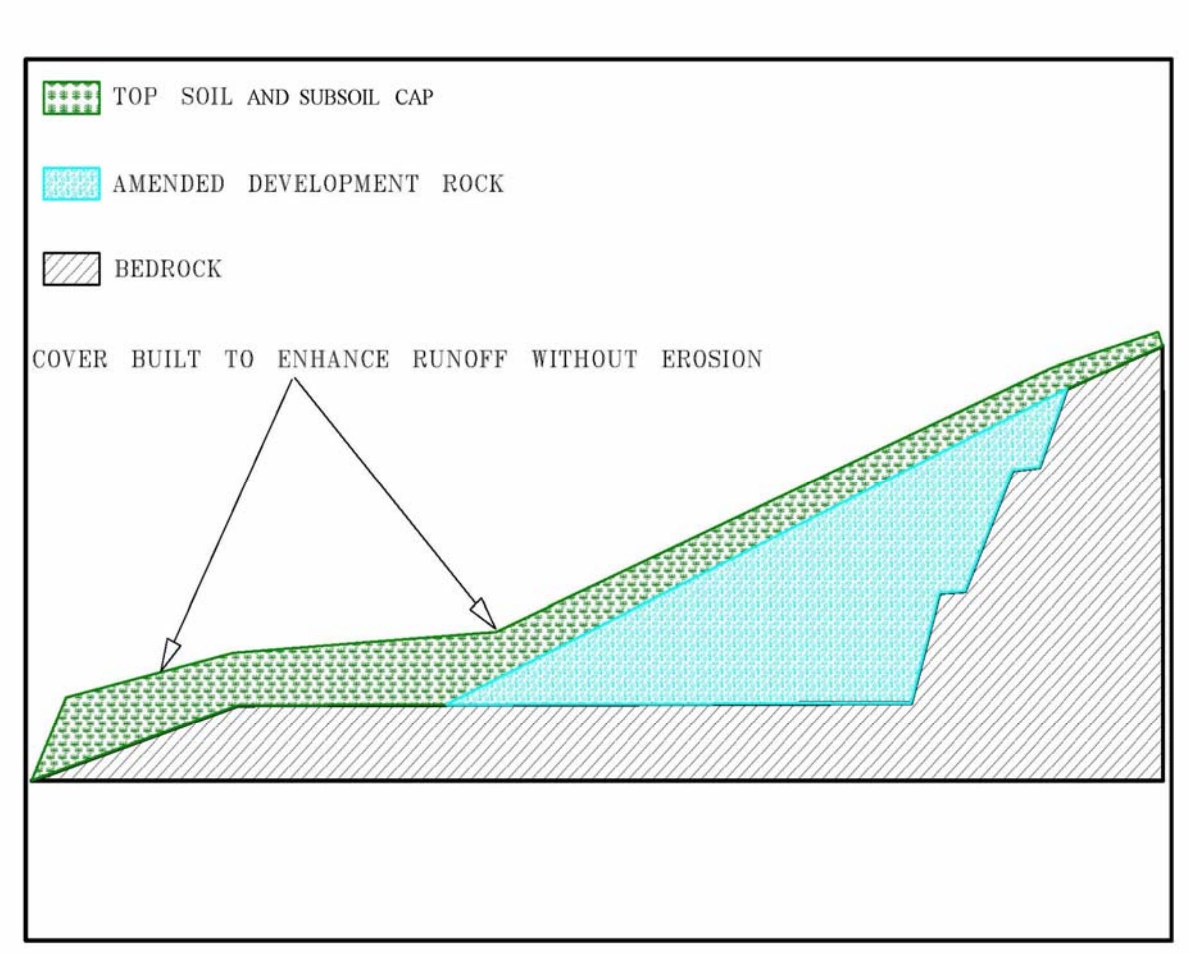
NAME	COMMON NAME	APPLICATION RATE
Agropyron spicatum	'Goldar' Bluebunch wheatgrass	9.3 lbs/acre
Festuca idahoensis	'Joseph' Idaho Fescue	2.9 lbs/acre
Agropyron trachycaulum	'Pryor' or 'Revenue' slender wheatgrass	2.7 lbs/acre
Poa secunda	'Sherman' big bluegrass	0.5 lbs/acre
Lolium multiflorum	Annual ryegrass	1.9 lbs/acre
Medicago sativa	'Ladak' or similar alfalfa variety	2.1 lbs/acre
TOTAL: pure live seed/acre		**19.4 lbs/acre**

Seed would either be harrowed or raked to prevent it from blowing away. In areas not reachable by mechanical equipment, the seed would be covered with straw or tackifier.

Mount Heagan Pit Backfill

The primary design for the reclamation of the proposed Mount Heagan Pit includes re-sloping the overburden rock material placed as backfill, covering it with soil, and revegetating it (Figure 10). The Mount Heagan Pit Backfill would be graded to match the hillside as closely as possible at a slope of 3.5H:1V. Portions of the top of the pile would be reclaimed with a convex slope to better simulate natural topography. The rock pile would then be covered with a compacted subsoil layer 6 inches thick. Topsoil would then be placed to a thickness similar to the surrounding landscape, which is about 12 inches. The topsoil cap would be roughened by walking a tracked dozer to reduce drainage off the pile without creating channels for water to collect, infiltrate, or concentrate (Figure 10), then amended with limestone as necessary to neutralize any acid generated, and seeded.

Figure 10-Conceptual Mount Heagan Pit Backfill Reclamation Cross-Section.

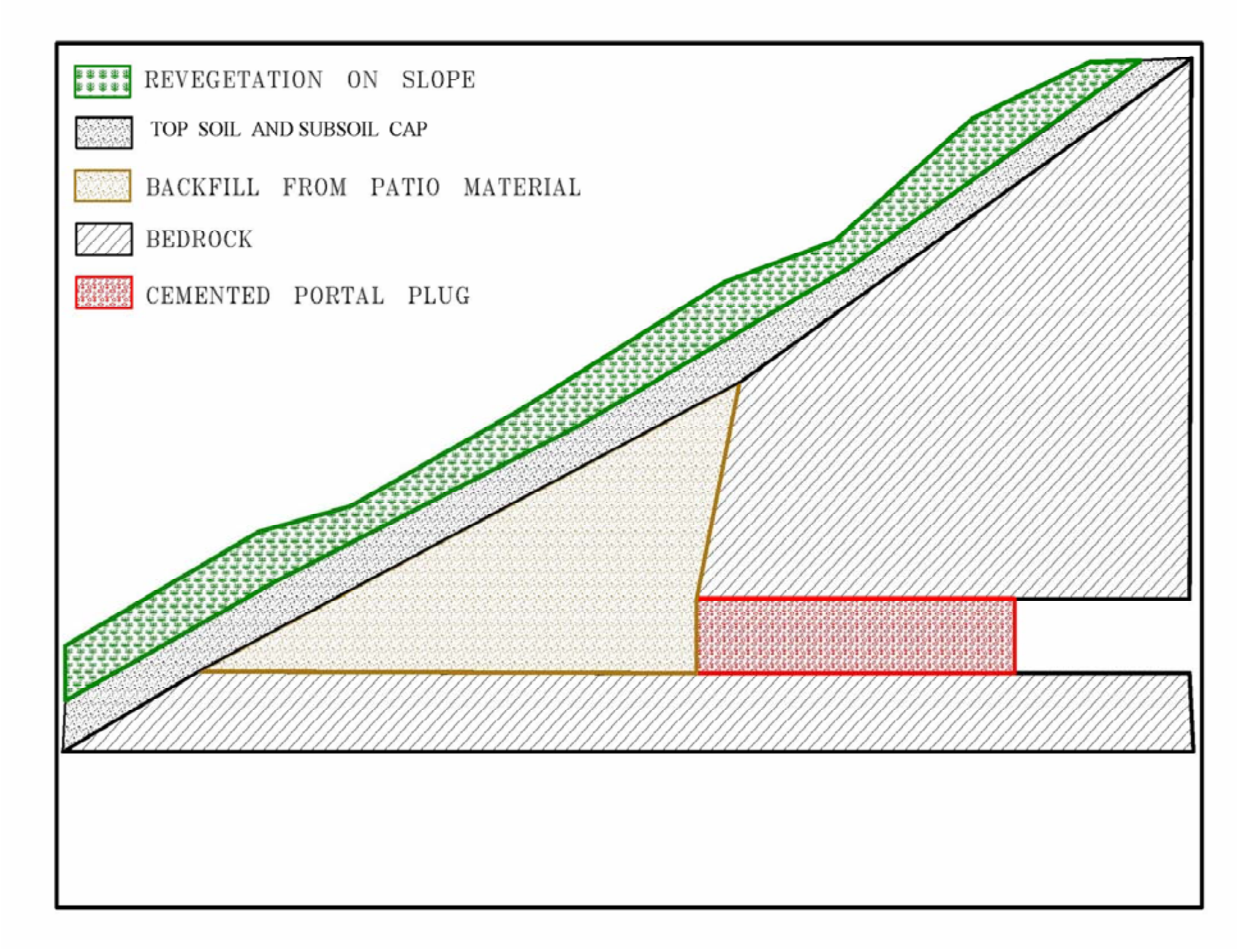


Portals

At closure, all metal, pipes, pumps, supplies, electrical wires, and other equipment would be removed from all underground workings. All portals would be backfilled to at least 25 feet with inert mined material. All portal steel sets would be removed. The portal area including the patio would be regraded to match the surrounding contour, which is a 2.5H:1V slope. Soil would be reapplied to the recontoured area, and drainage structures would be constructed to promote runoff and impede runon (Figure 11).

Figure 11 is a cross-section view of the planned portal plug. If operational mapping indicates any places in the underground decline that could collapse and cause surface subsidence, these areas would be backfilled prior to installing the portal backfill. The excavated ore zones would largely be backfilled, which would provide long-term protection against surface subsidence. The oxide ore zones would be backfilled using rock from the underground workings and cement. This would serve as a solid, 190-foot-thick crown pillar to prevent subsidence. The sulfide ore zones would be mostly backfilled using rock from underground, removing available open space necessary for a collapse.

Figure 11-Conceptual Portal and Patio Reclamation Cross-Section.



Saddle Facilities Area and Equipment

Upon completion of the Proposed Action, all buildings, equipment parts, supplies, and demolition wastes would be removed from the site. Property fencing separating EGI land from the USFS land would be removed from the site. Fencing around percolation ponds would also be removed from the site. Anything that cannot be sold, recycled, or otherwise reused at a different location would be removed to an approved solid waste disposal site.

- All buildings, structures, sheds, and equipment would be removed from the site.
- Septic system tanks would be pumped out, cleaned, and backfilled with gravel or sand to prevent subsidence.

- The liner would be removed from the surge pond, and the pond backfilled using the material excavated to create the pond.

- Concrete pads would be broken up and removed to the Mount Heagan Pit or used as backfill in the portals.

- All compacted areas would be ripped to loosen soil material and the material re-graded as needed to establish drainage.

- Stored soil or growth medium would be replaced to a depth of 1 foot and drainage structures established to promote runoff and impede runon. The area would be seeded and revegetated.

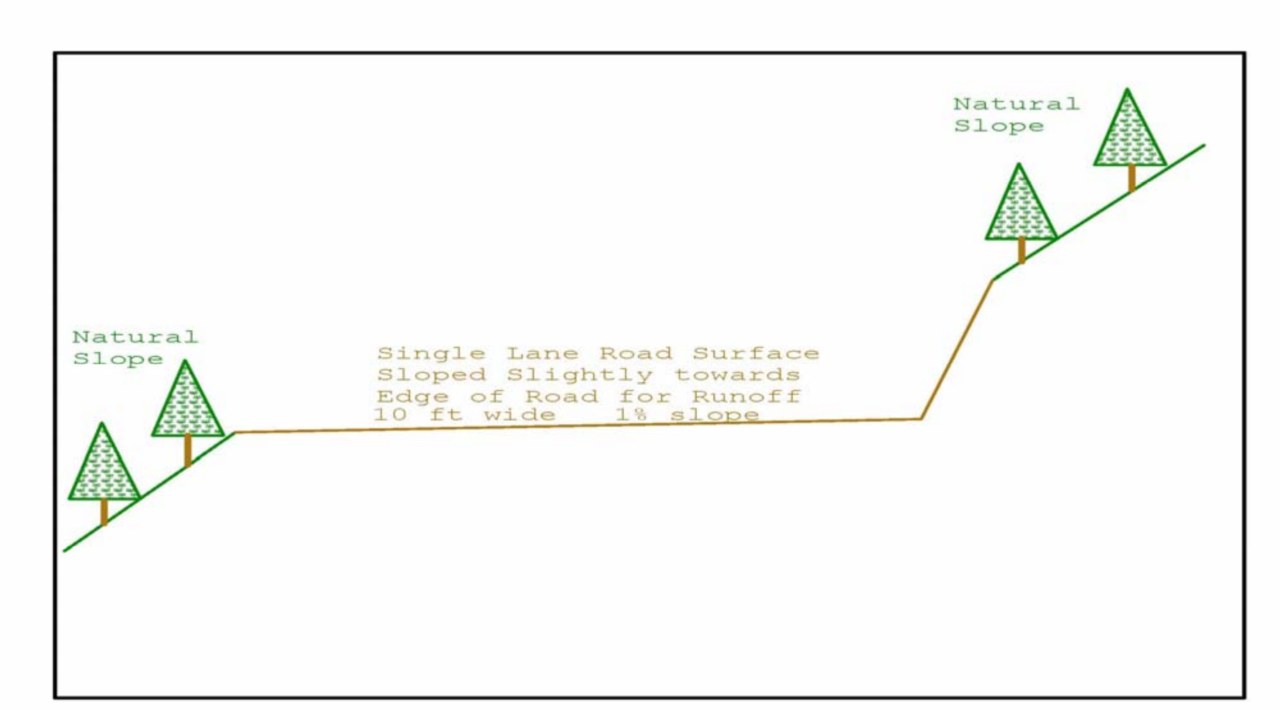
Truck Loading Area

All concrete would be broken up and buried in the development rock pile or placed as backfill in the portals. All other structures and man-made materials would be removed, the site would be regraded to an even contour, compacted areas would be ripped, and soil would be applied to a depth of 1 foot and revegetated.

Roads

The mine access roads from the county road to the Saddle Facilities Area and the one-way loop from the Saddle Facilities Area to the mine portals are to be left as primary property access roads. As such, mine access roads would be returned to a 10-foot running width by removing the safety berm, pulling back fill slopes, and using the material to fill the cut slopes. These newly exposed surfaces would be ripped and seeded. Road surface drainage would be established, and sediment control structures established (Figure 12).

Figure 12- Conceptual Reclaimed Road Cross-Section



Core Shed Area

All mining and exploration materials would be removed from the Core Shed, and all core would be buried in the Mount Heagan Pit or used as backfill in the portals. The empty core shed would remain as a storage shed for property use.

Proposed Post Mine Environmental Monitoring Programs

Reclaimed areas would be evaluated two years after reclamation. If bare spots are present, soil would be tested for fertility, and fertilizer would be applied if needed. Bare spots would then be reseeded. Evaluations for excess erosion would be made annually. If excess erosion, such as rilling or overland sediment transport has occurred, it would be repaired and appropriate best management erosion control measures utilized.

Surface water and groundwater monitoring would continue as specified in the operational water quality monitoring plan for a period of two years after the completion of reclamation.

2.3 ALTERNATIVES TO THE PROPOSED ACTION

2.3.1 No Action Alternative

The No Action Alternative represents the existing conditions on the site approved by DEQ under the exploration license and as described in Section 2.1. If the No Action Alternative is selected by the DEQ, the Golden Dream Mine Project would not be permitted. The disturbances outlined in the Proposed Action would not occur, and all disturbances created by EGI for the purpose of developing the Golden Dream Mine Project would be reclaimed under the exploration license reclamation plan.

2.3.2 Proposed Action

If the Golden Dream Mine Project is approved, it would go forward as described in Section 2.2. EGI would be responsible for carrying out the Proposed Action as stated in its permit application as well as following appropriate permits such as: Storm Water Pollution Prevention Plan permit, Air Quality permit, and any mandated water discharge permits.

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL IMPACTS

Existing environmental conditions and resources and potential direct, secondary, and cumulative impacts of the Proposed Action are described in this section. Also included in this section is the history of the affected area. The DEQ has evaluated the potential impacts that could result from the No Action Alternative and the Proposed Action.

Affected Environment

Previous property owners have conducted numerous baseline environmental studies since the early 1990s. Santa Fe Pacific Gold, Inc. (Santa Fe) conducted baseline studies of soils, wildlife, fisheries, vegetation, aquatic invertebrates, cultural resources, rock geochemistry, water resources, land use, roads/recreation, socioeconomic, sound, land use, and wilderness. The Santa Fe proposed project area was larger than the Proposed Action, but contained the present EGI property. These studies have been used to develop the baseline information discussed in this chapter. As required, some of these studies have been updated.

Resources Status and Possible Effects Analysis

The Proposed Action may affect the physical environment and the human population in the area. The table below lists the resources of the human environment and their presence in the project area. The potential of being affected by the Proposed Action is listed for each resource.

Table 8- Resources Evaluated in Project Area

RESOURCES	STATUS	IMPACTS ANALYSIS
Surface Water	Existing condition is degraded.	No predicted impacts. Evaluated with Groundwater.
Groundwater	Existing condition is degraded.	Impacted by dewatering.
Soil	Degraded due to historic and permitted exploration activities.	Soil development would be affected.
Geology	Gold ore deposits identified.	Affected due to mine

		development.
Air Quality	Good.	Potentially affected.
Wildlife	Wildlife is diverse in the area and has been somewhat affected by exploration activities.	Affected due to mine development.
Vegetation	Historically degraded due to mining, logging, and weed infestation.	Affected due to mine development.
Wetlands	Wetlands exist in several area drainages.	No predicted impacts.
Fisheries and Aquatic Resources	Existing condition is degraded.	No predicted impacts.
Noise	Wooded rural area with low background sound.	Affected by Proposed Action.
Cultural	Historic mining sites in the area.	No predicted impacts.
Land Use	Historic mining, logging, and wildlife habitat.	Affected due to mine development.
Recreation	Access for recreation limited on private land owned by EGI. Activities available in surrounding public lands.	No predicted impacts.
Socio-Economics	Limited employment in Elkhorn area.	Affected due to mine development.

3.1 RESOURCES ELIMINATED FROM FURTHER STUDY

The DEQ has assessed the presence of and evaluated the possible impacts on the resources from the Proposed Action, and has determined the Proposed Action would not affect the following resources. These resources will be described and the rationale for dismissing further evaluation follows in this section.

3.1.1 Wetlands

The wetlands survey performed by Hydrometrics Inc. (1994) was reevaluated by WESTECH in 2006 to determine whether its conclusions were still valid with respect to the Proposed Action. The 1987 Wetland Delineation Manual prepared by the U.S. Army Corps of Engineers (COE) Environmental Laboratory provides guidance to delineate wetlands based upon the identification of hydrophytic vegetation, wetland hydrology and hydric soils. Soil and vegetation samples were taken throughout the Elkhorn Creek watershed, which includes the Proposed Action and surrounding areas (WESTECH 2006). There are no proposed direct disturbances to area wetlands.

The closest wetlands identified in the 1994 study and evaluated in 2006 lie in Slaughterhouse Gulch roughly 2,200 ft southeast of the proposed mine dewatering area (Portal Area on Figure 4) and Greyback Gulch about 800 ft west (Figure 9). The Hydrometrics dewatering tests showed a drawdown of 2 feet roughly 500 feet from the dewatered well. Monitoring wells within a three hundred feet showed drawdowns of 10 feet (Hydrometrics 2005/2006). Due to the distance between the dewatering wells and the wetlands in relation to minimal groundwater drawdowns from adjacent test wells, there are no predicted indirect dewatering impacts to Slaughterhouse or Greyback Gulch wetlands.

This issue will not be evaluated further since no wetlands are to be directly or indirectly impacted by the Proposed Action.

3.1.2 Fisheries and Aquatic Resources

The fisheries and aquatic resources survey performed by Westech (1994) was reevaluated in 2006 to determine whether the description of the fisheries is still valid. The study indicated that brook trout is the primary fishery in the project area with the most fish inhabiting Turnley and Elkhorn creeks (both classified as third order streams). Of the total 253 brook trout collected for the study, 57 percent of the fish were collected in Turnley Creek. One mottled sculpin was collected in the study area. No fish were collected or observed in certain reaches due to shallow stream depth and low flow. Length frequency distribution data showed that all age classes were present in Elkhorn and Turnley creeks (WESTECH 1994).

The 2006 reconnaissance showed no change in the fishery or fish habitat in Greyback Gulch or Slaughterhouse Gulch since the 1994 survey. Montana Fish, Wildlife and Parks has assigned a habitat class value of 6 to Slaughterhouse Gulch (the lowest possible rating) and a sport fishery value of 5 (no game or sport fish present), giving it a final value of “limited.” The presence of westslope cutthroat trout or the potential for cutthroat habitat has not been observed in creeks that drain the project area (WESTECH 2006). Fishery issues will not be evaluated further in this analysis.

Aquatic resource studies were conducted by WESTECH in the project area for Santa Fe (WESTECH 1994). DEQ did not require EGI to update aquatic resource studies because of the limited scope of the Proposed Action compared to Santa Fe’s original proposal. The Proposed Action does not impact aquatic resources. Aquatic resource issues will not be evaluated further in this analysis.

3.1.3 Cultural Resources

Between August 8 and August 29, 1994, Western Cultural Resource Management performed for Santa Fe a reconnaissance survey of approximately 2,850 acres for the original Elkhorn Project, near the Elkhorn town site (Western Cultural Resource Management 1994). An additional cultural survey was performed in 1996 by GCM Services Inc. These surveys were intended to provide a comprehensive picture of the cultural resources present within the proposed Elkhorn Project area of 4,100 acres. The Proposed Action permit area is within the area included in these surveys.

The entire area was surveyed at the Class III level (locating all cultural materials), and located sites were identified. During the course of the reconnaissance 65 new archaeological sites and 97 isolates were located. Of the sites, 50 were historic, 14 were prehistoric, and one had both prehistoric and historic components identified. There were also a couple of sites with stone features that may be either prehistoric or historic. Six of the isolates were prehistoric while the remaining isolates were historic. Prehistoric materials included lithic scatters, stone circles, lithic procurement areas, and isolated artifacts. Two areas where quartzite and chert outcrops had been quarried for toolstone and one area where exposed basalt cobbles had been worked were noted within the project area.

The majority of the historic sites or isolates were related to 19th and early 20th century mining activity, but a few sites associated with historic ranching were also found. Evidence of historic logging is found throughout all forested areas within the project area. Of the recorded cultural sites located within or partially within the proposed permit area, only the Sourdough Complex site was considered eligible for listing on the National Register of Historic Places (GCM 1996). Based on a review of the cultural studies and the proposed disturbance of the Golden Dream Mine Project, this site would not be impacted by the Proposed Action. Integrity of the other sites within the proposed permit area is described as "diminished" with minimal historical or cultural value (GCM 1996). Cultural resource issues will not be carried forward in the analysis.

3.1.4 Land Use

A baseline land use investigation was performed by Hydrometrics in September 1994. The objective of the investigation was to identify and describe existing land uses that may be affected by development of the Elkhorn Project.

The Elkhorn Mountains were designated by the US Forest Service (USFS) as a special Elkhorn Wildlife Management Unit in 1981. Later that year, a study investigated the potential for designating a portion of the Elkhorn Mountains as wilderness. A wilderness designation would allow the managing agencies, which include the US Forest Service and Montana Department of Fish, Wildlife, and Parks, to set goals for the Elkhorn Mountains as an ecological unit and provide consistent policies and standards for managing the area.

The administrative agencies' baseline study designated management areas in and around the Elkhorn Project area and established goals for each area. The Elkhorn Project area was separated into eight management areas. All management areas had similar general goals to improve wilderness conditions. Management goals are area dependent and maintain or improve vegetative conditions, provide recreation use sites, and optimize elk wintering ranges by emphasizing forage and thermal cover. Some areas would optimize mountain goat habitat or elk calving habitat.

Private, state, USFS, and Bureau of Land Management (BLM) lands surround the project area. Land is used primarily for livestock grazing. Some private cabins and year-round residences are present in the area. All state lands adjacent to the project area are leased for grazing. The BLM lands are generally open for public use. Management of these lands currently emphasizes wildlife and hunting as the predominant public use activity (Hydrometrics 1994).

The Golden Dream Project would occur on privately held claims, which are closed to public access. The Proposed Action would not impact the decisions made by the USFS, BLM, state, or other surrounding agency land owners in regards to their land management decisions. Impacts from local citizens have been considered by EGI and the DEQ in the scoping process. EGI has developed plans to limit impacts to roads, etc. as described in Section 2.2.4. The land use issue will not be carried forward in analysis.

3.1.5 Recreation

On-site information concerning local recreational use was collected during the recreational resource baseline investigation performed by Hydrometrics Inc. in 1994. The collected data have been used in conjunction with existing land management agency resource information to characterize the area baseline recreational resources. Existing information was compiled by reviewing agency reports and conducting interviews with individuals knowledgeable about the area. Supplemental site specific use information was gathered during October 1993 and February 1994 on-site recreational surveys and from traffic counters installed on county and USFS roads within the project area.

The Elkhorn Mountains offer a diverse recreational opportunity for public use. Hunting, fishing, sightseeing, hiking, biking, snowmobiling, four-wheeling and other recreational driving, and cross country skiing are all available recreational opportunities within the Elkhorn Mountains. Two recreational surveys were performed in October 1993 and February 1994. The respondents indicated that their primary activity in the area was (listed in order of predominance) sightseeing, hunting, hiking, wildlife viewing, or recreational driving. A majority of individuals listed visiting the Elkhorn ghost town as a primary activity. The respondents were Montana residents or first time visitors who were only staying one day (Hydrometrics 1994).

The Proposed Action is located on privately held claims and would be fenced and signed. In the past hunters and recreational users have inadvertently strayed onto EGI property. Fencing and erecting signage on this private property would protect public safety and EGI security. There are no predicted impacts to recreation due to the Proposed Action. This issue will not be carried forward in analysis.

3.2 RESOURCES EVALUATED

The following resources have been identified by the DEQ as being possibly affected by the Proposed Action.

3.2.1 Air Quality

NO ACTION ALTERNATIVE

Impacts

EGI is in the process of applying for an Air Quality permit from the DEQ. Presently, exploration traffic, logging, recreational traffic, and seasonal wildfires contribute to decreased air quality in the project area. If the Proposed Action is not permitted, there would be no new air quality impacts.

PROPOSED ACTION

Impacts

Impacts on air quality would be increased due to dust and tail pipe emissions from proposed mining traffic in the project area and ore hauling on the county road. There would be a maximum of 45 round trips a day by nine, 30-ton over-the-road haul trucks plus the traffic generated by employees and suppliers.

Monitoring

Dust control on the county and mine roads is proposed through the Jefferson County road agreement and proposed permit application (See Section 2.2.4). EGI proposes to control dust through water or approved dust control agent on its property and the Elkhorn County road. Monitoring and protection of air quality would be regulated under the Air Quality permit that would have to be approved by the DEQ. EGI would have to comply with the limits in the Air Quality permit.

Cumulative Impacts

Fugitive dust from mine development and haul traffic would add to air impacts from recreational and residential traffic along the Elkhorn road.

3.2.2 Wildlife

A wildlife baseline study of 3,360 acres including the Proposed Action area observed 89 species of birds, 33 mammals, and 2 reptiles (WESTECH 1995). Elk, moose, and mule deer were the big game species observed on or near the project area. Blue grouse and ruffed grouse were also recorded near the project area. The area is utilized as a normal summer range for elk and mule deer. The project area is not used by elk for "key summer" or "key winter" range habitat.

An update of the area wildlife inventories was performed in June 2006 (WESTECH 2006). It includes: Fisheries and Species of Concern, Aquatic Biological Resources and Species of Concern, Wildlife Habitats, and Bats and Terrestrial Vertebrate Species of Concern.

Wildlife evaluations of the Golden Dream Mine Project site identified logging and grazing impacts as having reduced the availability of habitat for deer and elk in the project area since the 1995 study. The proposed mine area was examined for suitable habitat and presence of bats. No evidence of bats or roosts was found. Though more recent studies in the Elkhorn Mountains have identified bats at lower elevations, no bats have been located at the elevation of the proposed mine disturbance. Potential habitat for: gray wolf, grizzly bear, Townsends Big Ear Bat, Western Toad and the Olive sided Flycatcher exists within 10 miles of the project area, none of these species has been observed in the 1995 or 2006 studies of the proposed mine site. Grizzly bear and gray wolf would likely only occur as transients in the area; no known sightings of wolves or grizzly bears have been recorded in the area by the Montana Natural Heritage

Program. It is possible that Canadian lynx are present at least as transients in the Elkhorn Mountains but the habitats in and adjacent to the Golden Dream Mining Project are not preferred. The probability of lynx use of the proposed permit area is considered to be low. No threatened or endangered species have been found on or near the proposed mine site (WESTECH 2006).

NO ACTION ALTERNATIVE

Impacts

Wildlife have been displaced by the exploration activities on the site. If the Proposed Action is not permitted, wildlife in and around the proposed disturbed areas would not be further impacted.

PROPOSED ACTION

Impacts

Deer, elk, and other wildlife would be displaced from their habitat by mining activity associated with the Proposed Action. Fewer than 30 acres would be actually disturbed by the proposed project, but roads and traffic within the 382.5 acre permit area would increase the displacement effects. The area of this predicted impact is limited compared to the available habitat for these species in the surrounding area. Any wildlife displaced due to these disturbances have other habitat available in the surrounding USFS land. Some wildlife may become habituated to the increased noise and human activity.

Monitoring

There are no monitoring measures proposed for wildlife. No threatened, sensitive, or endangered species have been observed on or near the proposed mine site.

Cumulative Impacts

Habitat in the project area for some wildlife species has been altered through logging, grazing, mineral exploration, and wildfire. Habitat restoration projects undertaken by USFS and BLM involve management of vegetative communities including grassland, shrub land, forests and woodland, riparian vegetation, and noxious weeds. Most restoration projects developed by the Elkhorn Implementation Group would likely continue. Restoration projects would reduce the effect of past land uses including mining, grazing, timber harvest, and recreation.

3.2.3 Environmental Geochemistry

Development of the Golden Dream Mine would involve excavating a spiral decline in country rock adjoining the ore zone about 3,850 linear feet to the 6,410-foot elevation level. A 10,000 ton bulk ore sample would be taken from that level and processed to determine future mine production operation. Above the 6,410-foot level, approximately 64,000 loose cubic yards (lcy) of development/non-ore rock would be produced during excavation of the decline and would be placed in a stockpile in an existing unreclaimed mine pit on the surface in the Project Area (see Section 2.2). Development work to the 6,410-foot level has been approved through an amendment to Exploration License number 00617.

Four non-ore rock lithologies (described in Section 2.2.5) would be encountered during advancement of the decline and initial mine stopes. Table 9 shows the projected volumes of each non-ore rock type that would be encountered during development of the Golden Dream Mine and placed in a rock stockpile on ground surface in the existing Mount Heagan Pit.

Table 9- Estimated Development/Non-Ore Rock Volume Placed at Ground Surface

Lithology	Percent of Total	Approximate Volume (lcy)
Diorite	33	24,960
Hornfels	26	19,840
Endoskarn	19	14,080
Quartz Monzonite	22	16,120
Total	100	75,000

Source: Elkhorn Goldfields 2007.

After completion of development work to the 6,410-foot level, an additional 11,000 lcy of non-ore rock (mostly quartz monzonite) would be removed and placed in the surface stockpile, which would occur early in the mining process. After some initial stopes have been mined, all remaining non-ore rock would be placed underground in mined-out stopes. Other non-ore rock types that would be encountered to a lesser extent during complete ore mining operations include the following:

- Exoskarn – Green, red, or black metamorphic rock that contains high concentrations of calcium and silicon. May have some sulfide mineralization.

- Marble – Massive, coarsely crystalline, white or white-gray banded metamorphosed limestone.

A more detailed description of these non-ore rock units may be found in Elkhorn Goldfields 2007 Operating Permit Application.

Non-Ore Rock Characterization

Some rocks produced during mining could have the potential to generate acid when exposed to precipitation and the atmosphere. Other rocks have properties that neutralize acid. Acidity is measured using the pH scale (a scale that indicates corrosiveness). Acidic pH values are low (0 to 6) and basic or alkaline pH values are high (8 to 14). Neutral water has a pH of 7. Tests have been formulated that will indicate the probability that rocks would generate acid when in contact with water and the atmosphere. These tests take into account the minerals in the rock that are acid producing and the minerals in the rock that have neutralization potential [NP]: those that would resist (buffer) lowering the pH (which could tend to promote acid generation) of water coming in contact with the rock.

One method is called static acid-base accounting (ABA). This short-term test measures the change in pH of water in contact with rock samples. Two other short-term static tests were used to determine the potential of rock from the Proposed Action to generate acid or leach metals. These tests include the saturated paste extract, which measures the pH (corrosivity) of a paste made of finely crushed rock and distilled (pure) water. Long-term laboratory tests include the kinetic humidity cell test, which simulates the effect of long term exposure of rock to the atmosphere, and this test is also used to determine the acid-generation potential of rock.

Exploration drilling has been ongoing in the Elkhorn District since the 1980s. Santa Fe collected approximately 1,250 samples of ore and non-ore rock throughout the Elkhorn Mining District in the 1980s and 1990s. Of these samples, 511 are from boreholes in and near the Golden Dream deposit, and 347 of the 511 samples are representative of the four non-ore rock lithologies (listed in Table 9) that would be encountered during excavation of the Golden Dream Mine Project decline. Historic data for the Golden Dream deposit samples indicate that the diorite, quartz monzonite, and endoskarn non-ore lithologies could, on average, be expected to generate acidic leachate (Tetra Tech 2007a). Historic analyses were conducted using an undocumented method to determine whole rock values of acidification potential and neutralization potential (Tetra Tech 2007a). Similarly, it is unclear what method was used for whole rock metal analyses (Tetra Tech 2007a).

Because the analytical methods used in the 1980s and 1990s are undocumented, it is possible that the lack of correlation between new and historical data, with respect to potential for acid generation and leachable metals, is method-related. Additionally, the "nugget effect," which is over-representation or bias in a test result occurring from a "nugget" or otherwise unrepresentatively large concentration of a particular constituent, may result in some differences between new and historical test data (Tetra Tech 2007a). This is not uncommon for skarn-type mineralization, which can be highly heterogeneous. Based on these uncertainties, EGI elected to further define representative non-ore rock composites by additional testing (Tetra Tech 2007a).

Recent Sampling

The sampling program initiated in 2007 by EGI for geochemical baseline characterization consisted of four phases: 1) splits of the historic samples obtained by Santa Fe were collected for acid-base accounting tests and whole-rock metals analysis; 2) recent samples of the four non-ore lithologies obtained by EGI near the proposed decline were submitted for acid-base accounting tests and whole-rock metals analysis; 3) composites of each of the four non-ore rock lithologies were prepared and tested for metal mobility, and the quartz monzonite was subjected to a kinetic humidity cell test; 4) samples of the four non-ore rock lithologies were collected from historic waste rock dumps and tested for metal mobility and saturated paste extract pH values. All composite samples were adjusted to match the distribution for the entire deposit with respect to the main parameters of concern: the ratio of neutralizing potential to acid-generating potential (NP:AP) and arsenic and copper concentrations.

Because preliminary testing indicated the potential need to amend quartz monzonite non-ore rock to neutralize acid drainage, additional metal mobility testing was performed on two composite samples amended with marble from the Golden Dream Project Area and limestone from Graymont Western (Tetra Tech 2007b).

<u>Recent Static Testing</u>

Acid-Base Accounting

Acid-base accounting tests are a short term test used to determine the acid-generating potential (AP) and neutralizing potential (NP) of a rock sample (Sobek *et al.* 1978). The ratio of these values, along with net neutralization potential (NNP = NP – AP), is used to assess the acid-generating potential of rock samples as shown in Table 10. Individual rock types are deemed unlikely to generate acid if the neutralization potential to acid-producing potential (NP: AP) ratio is greater than 3, and the net neutralization potential (NNP) of the rock is greater than 20.

Table 10- Acid-Base Accounting Criteria for Classifying Acid Generation Potential of Rock Samples

Classification	Criteria for Classification
Potentially Acid Generating	NP:AP < 1 and NNP < -20 tons/ktons
Uncertain Acid Generation Potential[1]	NP:AP between 1 and 3 and/or NNP between -20 and +20 tons/ktons
Unlikely to Generate Acid	NP:AP >3 and NNP > +20 tons/ktons

[1] Results in the "Uncertain" category typically are followed by long term kinetic testing using humidity cells to evaluate potential to generate acid leachate over an extended period of time.

NP = neutralizing potential; AP = acid-generating potential; NNP = net neutralization potential.

Source: BLM 1996; USEPA 1994.

The acid-base accounting test results for the Golden Dream Mine Project non-ore rock samples are contained in the *Final Golden Dream Project Baseline Environmental Geochemistry Evaluation of Mine Decline Development Rock* (Tetra Tech 2007a) prepared for EGI. These data from all phases of sampling are summarized in Table 11. These results show that, on average, the quartz monzonite lithology has uncertain acid generation potential, while the other three lithologies present an unlikely risk of acid generation. ABA results are supported by additional, longer-term humidity cell testing, which is a more rigorous test. At the time of writing this document, the kinetic test is in progress for the quartz monzonite. Further testing also includes the meteoric water mobility procedure (MWMP) and saturated paste extract pH test.

Table 11- Summary of Acid-Base Accounting Data for Non-Ore Rock Samples Golden Dream Mine Project

Lithology	Criteria	Number of Samples	Phase 1 & 2 Sample Tests			Phase 3 Calculated
			Minimum	Mean	Maximum	Composite[1]
Diorite	NP:AP[2]	13	1.9	22	70	16
	NNP[3]	13	16	52	110	43
Endoskarn	NP:AP	13	1.3	28	150	16
	NNP	13	8	73	180	75
Hornfels	NP:AP	13	4.2	56	170	31
	NNP	13	14	73	170	41
Quartz Monzonite	NP:AP	13	0.4	12	36	13
	NNP	13	-13	18	36	14

[1] Values shown for composite samples are weighted averages calculated based on analytical data for sub-samples and the relative percentage of each sub-sample in the composite.

[2] NP: AP = ratio of neutralization potential to acid generation potential.

[3] NNP = net neutralization potential in units of tons calcium carbonate ($CaCO_3$)/kiloton of rock.

Source: Tetra Tech 2007

Extract pH Values

The saturated paste extract test measures changes in the values of pH of water extracted from a sample of finely-crushed rock particles. Saturated paste extracts are prepared using distilled water (starting pH of 5.74) and crushed samples of rock. These data provide a means of comparing acidity from archived core with samples collected from historic non-ore rock dumps.

Values of pH measured in saturated paste extracts prepared from historic non-ore rock dump samples of diorite, endoskarn, hornfels, and quartz monzonite had final pH values from 7.75 to 8.58—neutral to slightly basic. The extract pH values prepared from the Golden Dream Mine Project diorite, endoskarn, and hornfels rock samples ranged from 6.85 to 8.58 (neutral to slightly basic). (Tetra Tech 2007a). These data indicate that sufficient neutralizing minerals are present to neutralize potential acidity after a prolonged period of weathering under field conditions.

Metal Mobility Testing

The meteoric water mobility procedure (MWMP) test is an American Society of Testing and Materials standardized (ASTM E 2242-02) method developed to predict trace element (metals) release from rock using a distilled deionized water leach under gravity flow with the experiment open to the atmosphere. The MWMP is used to predict the change in pH of precipitation that would fall on stockpiled rock from mining development. Leach tests work much like making tea. Pure water flows through the tea bag and dissolves compounds in the leaves to produce tea, which essentially is a "leachate". The water from the MWMP is a leachate or extract that is analyzed to find the concentration of dissolved metals. The test results are compared to Montana groundwater quality standards (Circular DEQ-7; DEQ 2006) to determine whether they are in compliance. The DEQ-7 standards were developed to protect the designated beneficial uses of state waters, such as the support of aquatic life, public water supplies, recreation, or agriculture (Section 75-5-301, MCA, Montana Water Quality Act).

Composites representing each of the four non-ore rock lithologies and amended quartz monzonite composite samples were evaluated for metal mobility using the MWMP test. Samples from historic non-ore rock dumps were also subjected to MWMP testing.

Metal mobility test results are summarized in Table 12. Results from metal mobility tests or rock samples from the Golden Dream Project show that most metals were not detected at their respective reporting levels. Arsenic concentrations measured in extracts from the hornfels composite and the historic non-ore rock quartz monzonite composite marginally exceeded the DEQ-7 groundwater standard. Manganese concentrations in extracts from the diorite and endoskarn composites exceeded the aesthetically-based secondary groundwater standard.
No other samples or constituents exceeded water quality standards, including the two amended quartz monzonite samples. Gross alpha and gross beta radionuclide tests were included in the MWMP analyses presented in Table 12, with concentrations ranging from 2.7 to 6.0 picocuries per liter in the quartz monzonite sample.

Values of pH measured in MWMP samples from drill core composite samples, amended samples, and historic non-ore rock dump samples range from 6.85 to 7.65 (Table 12). These results are within the Montana groundwater quality standard for pH of 6.5 to 8.5 (Circular DEQ-7; DEQ 2006).

Table 12-Metal Mobility Test Data

Parameter[1]	Reporting Limit	Groundwater Quality Standard[2]	Drill Core Composite Samples: Diorite	Drill Core Composite Samples: Endoskarn	Drill Core Composite Samples: Hornfels	Drill Core Composite Samples: Quartz Monzonite	Amended Samples: Limestone Amended Quartz Monzonite	Amended Samples: Marble Amended Quartz Monzonite	Historic Waste Rock Dump Samples: Diorite	Historic Waste Rock Dump Samples: Endoskarn	Historic Waste Rock Dump Samples: Hornfels	Historic Waste Rock Dump Samples: Quartz Monzonite
			Dissolved Concentrations in milligrams per liter (mg/l)									
pH (s.u.)	NA	6.5 – 8.5	6.85	7.28	7.41	7.49	7.39	7.39	7.22	7.55	7.65	7.52
Sulfate	0.30	250	49.2	7.88	2.47	6.41	3.48	7.83	8.53	1.13	ND	0.64
Silver	0.005	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aluminum	0.08	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	0.003	0.01	ND	ND	**0.0127**[3]	0.0041	0.0044	0.0059	ND	0.0047	ND	**0.0146**
Boron	0.1	NA	0.185	0.169	0.188	0.222	0.270	0.366	0.144	0.154	0.129	0.148
Barium	0.005	2	0.0079	0.0022	0.0158	0.0022	0.0024	0.0029	0.0051	0.0058	0.0021	ND
Beryllium	0.00007	0.004	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	0.0002	0.005	0.0004	ND	ND	ND	ND	0.00052	ND	ND	ND	ND
Chromium	0.001	0.10	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Copper	0.001	1.3	0.0120	ND	ND	ND	ND	ND	0.00135	0.00140	ND	0.00140
Iron	0.06	0.30	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Mercury	0.0002	0.002	ND	ND	ND	ND	0.00051	0.00026	ND	ND	ND	ND
Manganese	0.004	0.05	**0.0936**	**0.0814**	ND	0.0089	ND	0.0099	0.0187	ND	ND	ND
Molybdenum	0.008	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	0.010	0.10	0.035	ND	ND	ND	ND	ND	ND	ND	ND	ND
Lead	0.003	0.015	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Antimony	0.003	0.006	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Selenium	0.003	0.05	ND	ND	ND	0.00478	ND	ND	ND	ND	ND	ND

Table 12-Metal Mobility Test Data Continued												
Dissolved Concentrations in milligrams per liter (mg/l)												
Parameter[1]	Reporting Limit	Groundwater Quality Standard[2]	Drill Core Composite Samples				Amended Samples		Historic Waste Rock Dump Samples			
			Diorite	Endoskarn	Hornfels	Quartz Monzonite	Limestone Amended Quartz Monzonite	Marble Amended Quartz Monzonite	Diorite	Endoskarn	Hornfels	Quartz Monzonite
Strontium	0.005	4	0.0531	0.0134	0.0114	0.0292	0.0287	0.0376	0.0085	0.0123	0.0052	ND
Thallium	0.001	0.002	ND	ND	ND	ND	0.00128	ND	ND	ND	ND	ND
Vanadium	0.005	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	0.01	2.0	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Gross Alpha*	1.0	NA	1.1	ND	ND	4.1	4.6	6.0	ND	ND	ND	ND
Gross Beta*	2.0	NA	2.8	ND	ND	ND	2.7	3.9	ND	ND	ND	ND

[1] All units in milligrams per liter (mg/l), except pH in standard units (s.u.).
[2] Circular DEQ-7 (DEQ 2006).
[3] **Bold** and shaded values exceed groundwater standard.
NA = Not Applicable; ND = Not detected above the reporting limit.
Source: Tetra Tech 2007a, 2007b

*Dissolved Radionuclides in pico-curries per lite

Whole Rock Metals Characterization

Historic whole rock metals concentrations for Golden Dream non-ore rock and ore lithologies are included in Appendix 1 of the *Golden Dream Project Operating Permit, October 2007* (Elkhorn Goldfields 2007). Recent whole rock data obtained from splits of drill sample intervals used for historic acid-base accounting and whole rock metals are compared to historic metals concentrations in the *Final Golden Dream Project Baseline Environmental Geochemistry Evaluation of Mine Decline Development Rock* (Tetra Tech 2007a) prepared for EGI. As discussed previously, the comparison shows concentration variations possibly related to the "nugget effect", as its magnitude is greater in some parameters (copper, iron, and sulfur) than for others (arsenic and manganese) (Tetra Tech 2007a).

Ore Characterization

Ore-grade mineralization at the Golden Dream Mine occurs as three different mineral assemblages: pyrrhotite-chalcopyrite mineralization, magnetite-vosenite skarn, and oxidized ore. (For a more detailed description of the ore, please refer to the 2007 Golden Dream Operating Permit Application.) This ore would be transported to the Montana Tunnels Mine for processing. EGI has recently analyzed 46 ore samples for acid-base accounting (modified Sobek) and whole-rock metals (ALS Chemex method MEMS-41). A summary of these data was not yet available, but historic acid-base accounting data reported in the operating permit (Elkhorn Goldfields 2007) indicate that the oxidized ore zone has an average net neutralizing capacity of 27.6 tons $CaCO_3$ per kiloton of rock (17 samples), and the sulfide-magnetite ores have an average net acid generating capacity of -127.2 tons $CaCO_3$ per kiloton of rock (83 samples). A review of the recent ore sample data shows that the pyrrhotite ore is net acid generating, magnetite ore has an uncertain acid generating potential, and oxide ore has a net acid neutralizing capacity.

NO ACTION ALTERNATIVE

Impacts

About 11,000 lcy of non-ore rock may be stored at the Mount Heagan Pit site as part of the approved exploration plan; but full development of this area would not occur as described for the Proposed Action. This stockpiled rock is not expected to generate acid mine drainage as it would be made up of the rocks that have no potential for acid generation (diorite, endoskarn, and hornfels).

PROPOSED ACTION

Impacts

This section describes potential impacts from rock geochemistry resulting from operation of the Golden Dream Mine Project and potential impacts from future production below the 6,410-foot level, including the extraction of an additional 11,000 lcy of development/non-ore rock for placement above ground in the existing mine pit, and the exposure of rock walls in the Golden Dream Mine Project decline and mine workings. As stated previously, approximately 64,000 lcy of non-ore rock would be removed during decline development, resulting in a total of 75,000 lcy of non-ore rock being disposed at ground surface in an existing unreclaimed mine pit (Mount Heagan Pit, Figure 4). This site is located on a saddle in the Slaughterhouse Gulch drainage; approximately 1,000 feet southeast of the proposed production portal, which is located in the Greyback Gulch drainage (see Figure 4, Section 2.2). After stopes have been opened and ore removed, the remaining non-ore rock would be placed as backfill in open stopes as mining proceeds. No additional overburden would be placed in the surface non-ore rock pile.

Underground decline and mine workings would extend to approximately the 5,860-foot level through igneous and metamorphic rock. A portion of these workings would be backfilled with approximately 94,000 lcy of overburden consisting mostly of quartz monzonite removed from advancing the spiral decline and horizontal tunnels to access the ore zones. After cessation of mining, underground workings would be allowed to flood with groundwater. Depth to static groundwater measured in nearby dewatering test wells was approximately 130 to 160 feet below ground surface.

Recent acid-base accounting data collected on composite samples, prepared from historic core material that represents non-ore rock to be encountered in the decline and mine workings, indicate no potential for acid generation for three of the four non-ore rock types (diorite, endoskarn, and hornfels), with quartz monzonite having an uncertain acid potential. An ongoing kinetic test of the quartz monzonite lithology would be used to confirm potential for acid generation from non-ore rock placed above-ground in the existing unreclaimed Mount Heagan Pit.

Saturated paste extracts prepared from crushed samples of diorite, endoskarn, hornfels, and quartz monzonite collected from historic non-ore rock dumps had final pH values from 7.75 to 8.58. This indicates that sufficient neutralizing minerals are present to neutralize potential acidity after a prolonged period of weathering under field conditions. In addition, values of pH measured in MWMP samples from drill core composite samples, amended samples, and historic non-ore rock dump samples range from 6.85 to 7.65. These results are within the Montana groundwater quality standard for pH of 6.5 to 8.5.

Metal mobility test results show that arsenic concentrations from the hornfels composite and the historic non-ore rock quartz monzonite composite exceed the groundwater quality standard. Manganese concentrations from the diorite and endoskarn composites exceed the secondary groundwater standard. Placement of non-ore rock above-ground in the unreclaimed mine pit may result in some leachate with elevated concentrations of arsenic and manganese. Water infiltration into this non-ore rock would be minimized after reclamation of the stockpile surface. Additionally, attenuation of these metals probably would occur in the unsaturated zone prior to reaching the groundwater system.

The decline and mine workings would be exposed to oxygen during mining, which would result in initial flushing of some constituents as post-mine flooding occurs. Backfilled non-ore rock in the mine workings also would be subject to this initial flushing of groundwater. This would likely increase concentrations of these constituents in groundwater in and surrounding the workings when the groundwater table recovers to near pre-mining levels. Such increases would occur mainly from the pyrrhotite ore zone and to a lesser degree in the magnetite ore zone. Backfilling non-ore rock into some mine stopes would reduce the supply of oxygen to the wall rock and limit the mass of oxidation products.

Monitoring and additional testing of non-ore rock and wall rock would be conducted by EGI during the mining operation. On-going kinetic test results for the quartz monzonite lithology would demonstrate whether this rock type has acid generating potential. If kinetic test results for the unamended quartz monzonite show certain metals increasing over time, additional kinetic testing may be needed to assess the potential effect of the amendment on long-term metals mobility.

If the initial kinetic test on the quartz monzonite development rock shows acid generating potential, EGI has proposed amending the material with 5 percent marble and/or limestone. The use of amended quartz monzonite, if implemented, would supply additional neutralizing material to react with any acidity produced from the wall rock. Over time, groundwater would most likely approach ambient groundwater quality found in wells near the ore zone. EGI would also implement other methods such as segregation, encapsulation, or an engineered water resistant stockpile cap if amending development rock is found to be ineffective.

Nitrate Removal

An anoxic biotreatment cell (ABC) is one method that has been successfully used to remove nitrate, selenium, and perchlorate from low-temperature waters. It combines the low cost of passive biological treatment with the consistent, long-term effectiveness of commercial mechanical systems. A full-scale ABC operating at a metal mine in Montana since early 1996 has consistently removed over 90 percent of the incoming nitrate. Nitrate has also been biologically removed in another full-scale ABC, and in numerous pilot-scale and bench-scale evaluations. Selenium, perchlorate, sulfate, metals, and acidity have been successfully treated in ABC bench-scale column tests (Reinsel 2005).

The nitrate bioreactor proposed for this project would remove the majority of nitrate/nitrite contamination of groundwater. Possible contamination could occur based upon the use of nitrates in blasting materials. This bioreactor would be based upon existing models that have proven effective at removing up to 90 percent of nitrates from water. This system could treat up to 1,000 gpm and reduce nitrite levels as high as 110 mg/l to less than 10 mg/l (Reinsel 2005).

Monitoring

This section discusses monitoring actions described in the Golden Dream Mine Project operating permit application that relate to environmental geochemistry and potential impacts described above (Elkhorn Goldfields 2007). Development rock would be placed into the unreclaimed Mount Heagan Pit. The bottom of this pit is void of vegetation and contains actively oxidizing pyrrhotite skarn. No water has been observed flowing away from the base of the pit. Once the development rock is added to the pit, it would be capped and regraded to the natural contour of adjacent slopes. The final capped pile would limit water infiltration through the pile, promote runoff, and decrease available oxygen to the base of the pit, which would improve current conditions found at the site (see Section 2.2). Ongoing kinetic test results for the quartz monzonite lithology would demonstrate whether this rock type has any acid generating potential.

If the initial kinetic test on the quartz monzonite development rock shows acid generating potential, EGI has proposed amending the material with 5 percent marble from the mine area or 5 percent limestone from area limestone mines. MWMP tests on the amended lithology showed no exceedances of groundwater criteria standards, indicating that the short-term metals mobility is not increased by the amendment. If kinetic test results for the unamended quartz monzonite show certain metals increasing over time, then additional kinetic testing may be needed to assess the effect of the amendment on long-term metals mobility. EGI would also implement other methods such as segregation, encapsulation, or an engineered water resistant stockpile cap if amending development rock is found to be ineffective.

EGI would implement an operational testing program to ensure that wall rock encountered in the decline and mine workings matches predictions of the geochemical characterization. The operational testing program would allow changes to the material handling plan and to further guide decisions to support mine closure and bonding evaluations. The proposed operational testing plan consists of the following components:

1. **Data Collection concurrent with development rock storage:**
   For all development rock to be placed into the above-ground repository:
   a. Rock samples of the mine face would be taken approximately every 36 feet (or three rounds of advance), except in the quartz monzonite lithology where samples would be collected at each working face. These samples would be tested using the modified Sobek procedure to evaluate acid generation potential (Sobek et al. 1978).
   b. Sufficient volume of all samples would be archived for quarterly analysis and compositing.

2. **Quarterly composite sampling:**
   Each quarter, archived samples would be used to create composites representing each of the four primary non-ore lithologies. Quarterly composites would be comprised of eight sub-samples each for diorite, endoskarn, and hornfels, while the quartz monzonite would be comprised of 12 sub-samples.
   a. Quarterly composites would be tested using the modified Sobek procedure and MWMP method so that results can be compared to the baseline evaluation.
   b. If warranted by static test results, composites would be further evaluated using kinetic test methods such as the ASTM humidity cell.

3. **Field-scale barrel tests:**
   For each of the rock types encountered underground, a barrel test would be conducted, consisting of a drum filled with development rock and an additional drum of amended rock if the lithology is to be amended. The drum would be open on top to allow rain water to contact the non-ore rock. These barrels would be placed on the mine site near the overburden stockpile, and the leachate would be sampled quarterly for the first year and annually thereafter. Results of barrel tests would eventually yield data on long-term leaching properties of the non-ore rock. Testing would be conducted over a period of up to 5 years.

4. **Reporting:**
   Results of operational testing would be compiled and evaluated annually and reported to the DEQ in the annual report.

Cumulative Impacts

Cumulative impacts from rock geochemistry are not expected.

3.2.4 Surface Water and Groundwater

As the hydrologic connection between these resources is difficult to separate, these two resources will be discussed together. The Study Area for water resources lies within the Elkhorn Creek watershed (hydrologic unit code [HUC] 100200060503) (Figure 13). The Study Area is located in the upper Elkhorn Creek drainage near the historic mining town of Elkhorn. Elkhorn Creek flows southward from the Elkhorn Mountains. Tributaries to Elkhorn Creek within the Study Area include Slaughterhouse Gulch, Turnley Creek, and Greyback Gulch.

The mine portal patio for the decline and ventilation shafts would be located in lower Greyback Gulch. Office facilities and the development rock stockpile site would be located on the Slaughterhouse Gulch side of the saddle area between this drainage and Greyback Gulch (development rock would be placed into an existing unreclaimed mine pit). The ore load-out facility would be located in the lower Slaughterhouse Gulch drainage. The percolation ponds would be located throughout the Project Area (these ponds are to be used to infiltrate excess underground mine water and runoff water from development rock, after treatment, as necessary). A detailed description of the Proposed Action is included in Chapter 2 in Section 2.3.

A database of surface water and groundwater chemistry was compiled during previous exploration and mine planning activities in the Elkhorn Mining District. Hydrometrics, Inc. collected water resources information from September 1989 through August 1994. Maxim Technologies, Inc. completed sampling events in October 1994, March 1995, and May/June 1995. Water monitoring during 1989-1995 was conducted on behalf of Santa Fe Pacific Gold Corporation and was summarized in a comprehensive water resources monitoring report (Maxim 1996). Hydrometrics (2007) conducted additional surface water and groundwater monitoring in the Study Area during the period of 2005-2007 on behalf of EGI. This later monitoring was conducted at fewer sites than were used during the earlier monitoring period. For example, monitoring of Elkhorn Creek has not been conducted since 1995 in the Study Area.

Ongoing monitoring to be conducted by EGI, as specified in its Sampling and Analysis Plan, would supplement the existing database and retain appropriate monitoring locations and analytical parameters including common ions, nutrients, and metals (Elkhorn Goldfields 2007). Water monitoring sites are shown on Figure 13 and summarized in Table 13. These monitoring sites are the same sites used by Hydrometrics (2007) during its 2005-2007 monitoring activities. Other monitoring sites not included in Figure 13 and Table 13 were used for previous baseline studies, all of which are described in the Maxim (1996) report. Water quality and quantity monitoring also would be conducted for treated mine water to be discharged to percolation ponds. Water quality parameters analyzed during baseline studies for surface water and groundwater samples are listed in Table 14.

Figure 13- Water Resources

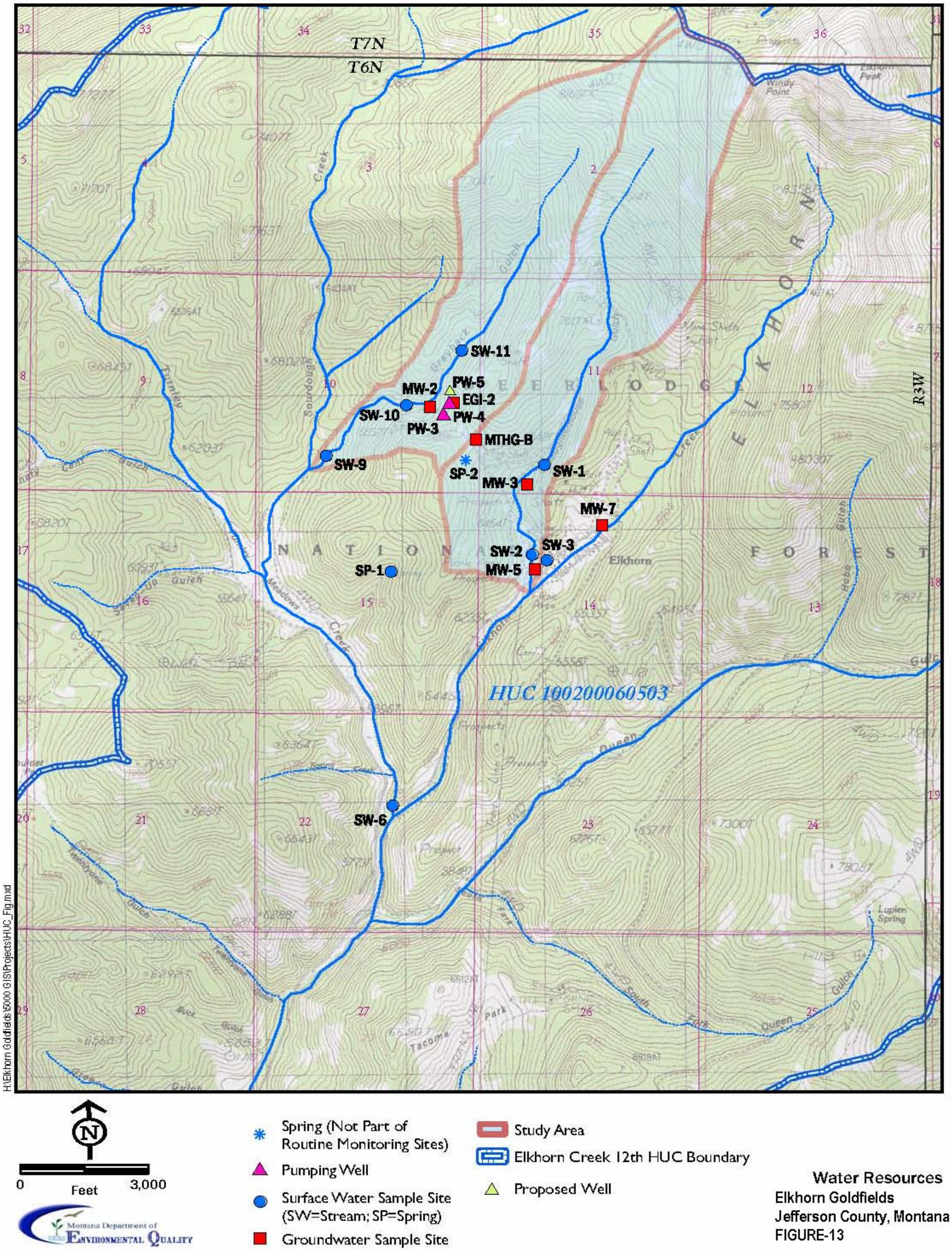


Table 13 - Water Monitoring Sites Golden Dream Mine Project

Surface Water	
Surface Water Site	**Description**
SW-1	Upper Slaughterhouse Gulch above East Butte area
SW-2	Slaughterhouse Gulch near mouth and county road
SW-3	Slaughterhouse Gulch spring house
SW-6	Turnley Creek upstream of confluence with Elkhorn Creek
SW-9	Greyback Gulch upstream of confluence with Sourdough Creek
SW-10	Abandoned adit seepage to Greyback Gulch
SW-11	Greyback Gulch upstream of mine area
SP-1	Spring in Turnley Creek drainage

Groundwater				
Well ID	**Description**	**Geologic Unit**	**Total Depth (feet)**	**Screened Interval (feet)**
MW-2	Greyback Gulch near proposed mine portal	Quartz Monzonite	180	40 – 180
MW-3	Slaughterhouse Gulch	Skarn	155	40 – 155
MW-5	Lower Slaughterhouse Gulch	Argillite / Exoskarn	125	20 – 125
MW-7	Town of Elkhorn	Quartz Monzonite	185	165 – 185
MTHG-B	Mount Heagen Well near unreclaimed mine pit	Endoskarn	400	20 – 400
EGI-2	Greyback Gulch near proposed mine portal	bedrock	“deep”	NR
PW-3	Dewatering well near proposed mine portal	Quartz Monzonite, Limestone, & Skarn	440	200 – 260 280 – 400
PW-4	Dewatering well near proposed mine portal	Marble & Skarn	572	170 – 572

Note: NR = not reported. See Figure 13 for locations of monitoring sites.
Source: Elkhorn Goldfields 2007.

Table 14- Analytical Parameter List Golden Dream Mine Project

Field Parameters	Common Constituents	Metals[1]	Nutrients
pH (s.u)	Calcium	Arsenic	Nitrate+Nitrite as N
SC (µmhos/cm)	Magnesium	Aluminum[2]	Ammonia N
Dissolved Oxygen	Sodium	Cadmium	Total Phosphorus as P
Water Temp. (°C)	Potassium	Chromium[2]	
Static Water Level (gw)	Carbonate	Copper[2]	
Flow (sw)	Bicarbonate	Iron	
	Chloride	Lead	
	Sulfate (SO_4)	Manganese	
	Total Dissolved Solids	Mercury	
	Total Suspended Solids	Molybdenum[2]	
	Alkalinity as $CaCO_3$	Nickel[2]	
	Turbidity (NTU)	Selenium[2]	
		Silver	
		Zinc	
		Antimony[2]	
		Beryllium[2]	
		Thallium[2]	
		Barium[2]	

Note: All units in milligrams per liter (mg/l) unless otherwise noted; **s.u** = standard units; **SC** = specific conductance; **µmhos/cm** = micromhos per centimeter; ˚**C** = degrees Celsius; **gw** = groundwater; **sw** = surface water; **NTU** = nephelometric turbidity units.

[1] Metals analyzed as total recoverable in surface water, dissolved in groundwater.

[2] Indicates parameter to be analyzed during initial sampling event only to confirm results of previous baseline sampling. Subsequent sampling and analysis may not include these parameters.

Source: Elkhorn Goldfields 2007.

Surface Water Quantity

Slaughterhouse Gulch drains an area of approximately 785 acres, flows from north to south through the eastern portion of the Project Area, and joins Elkhorn Creek near the town of Elkhorn. Greyback Gulch drains an area of about 635 acres and flows north to south through the western portion of the Project Area, joining Sourdough Creek approximately 3,000 feet above the confluence with Turnley Creek, which flows into Elkhorn Creek about 1 mile downstream from the town of Elkhorn (Figure 13).

Surface water flow measurements were periodically recorded during the periods of 1989 to mid-1995 and 2005-2007. At any given stream monitoring site flow is variable on an annual basis, reflecting input from spring snowmelt and rain events. Flow in Slaughterhouse Gulch ranged from a low of 0.005 cubic feet per second (cfs) in April 1991 to a high of 1.08 cfs in June 1995. Greyback Gulch was dry in April 1991; but in June 1995, it had a flow of 2.81 cfs. The flow in

July 2006 in Greyback Gulch was measured at 0.1 cfs at an upstream gage, and 0.5 cfs at a downstream gage (Hydrometrics, 2006). Turnley Creek, which has tributaries other than Greyback Gulch, exhibited a range in flow from a low of 1.25 cfs in October 1990 to a high of 17.61 cfs in June 1995 (Maxim 1996). Intermediate flow rates were measured in 2006 and 2007 that ranged from 2.34 to 6.56 cfs (Hydrometrics 2007). Flow in Elkhorn Creek in the Study Area appears to be perennial below the town of Elkhorn, with measured flow rates in the range of 0.03 to 20 cfs. Some segments of Elkhorn Creek have decreasing flow going downstream, indicating areas of surface water infiltration and/or removal for irrigation.

Storm water occurs as overland flow during periods of intense rainfall events and snowmelt runoff. This water collects in sub-basin drainages and eventually flows out of the Study Area in Elkhorn Creek, often with elevated levels of suspended sediment. Storm water at the Project site would be managed as part of the Storm Water Pollution Prevention Plan in EGI's storm water permit, approved by DEQ in April 2007. This management includes collection of storm water from disturbed areas in sediment basins, where the water would be allowed to infiltrate. If any of this water is deemed mine drainage or is unacceptable for infiltration due to quality, then the water would be pumped to a water truck and delivered to the water treatment facility (see Section 2.2).

A spring survey conducted in late summer 2006 identified two springs in the Study Area (Figure 13): SP-1 is located west of the Project Area in the Turnley Creek drainage; and SP-2 is located in the center of the Project Area near a reclaimed leach pad in the Saddle Facilities Area. Flow from both springs is reported less than 1 gallon per minute (gpm) (Elkhorn Goldfields 2007). Spring SP-1 is included in the ongoing monitoring program (Table 13).

Surface Water Quality

Elkhorn Creek is listed as impaired under Section 303(d) of the Clean Water Act for aquatic life, cold water fishery, and drinking water uses due to arsenic, cadmium, copper, lead, and zinc concentrations from historic mining activities (acid mine drainage, mine tailings, and dredge/placer mining) (DEQ 2007). The impairment is also caused by sedimentation/siltation, low flow alterations, and alteration in stream-side vegetative covers due to a variety of sources. For the 2006 303(d) list of impaired water bodies, 8 miles of Elkhorn Creek are designated as impaired, extending from its headwaters to Wood Gulch, which is about 4 miles downstream of the town of Elkhorn. The lower reach of Elkhorn Creek downstream from Wood Gulch is also listed as impaired for similar causes and sources (DEQ 2007). A total maximum daily load (TMDL) assessment has not yet been completed for Elkhorn Creek.

Data for the following surface water quality summaries are presented in Maxim (1996) and Hydrometrics (2007). The following discussion is for the monitoring stations listed in Table 13. Elkhorn Creek is not included in Table 13.

General Parameters

Values of pH for the 1989-1995 baseline period ranged from slightly acidic 6.0 at SW-10 (abandoned adit seepage) to somewhat alkaline 8.8 standard units (s.u.) at SW-2. Values of pH for the 2006-2007 baseline period ranged from somewhat acidic 5.23 s.u. at SW-9, to 8.19 s.u. at SW-2. Specific conductance (SC) measured in the field and laboratory for the 1989-1995 baseline period ranged from 66 micromhos per centimeter (μmhos/cm) at SW-11 to 778 µmhos/cm at SW-10. With the exception of SW-10, SC values at monitoring sites typically ranged from 100 to 300 µmhos/cm. Values of specific conductance for the 2006-2007 baseline period ranged from 66 µmhos/cm at SW-11 to 2,507 µmhos/cm at SP-2. Surface water temperatures ranged from 0.2˚C (32.4 ˚F) at SW-1 and SW-11 in January 1993, to 15.8˚C (60.4 ˚F) at SW-6 in August 1994. Surface water temperatures during the 2006-2007 measurement period ranged from 0.6˚C (33.1˚F) at SW-11 in April 2006 to 14.4˚C (57.9˚F) at SP-2 in September 2006.

Total dissolved solids (TDS) in surface water measured during the 1989-1995 baseline period ranged from 42 to 530 mg/l. Total Dissolved Solids during the 2006-2007 measurement period ranged between 56 and 2,160 mg/l, with the high concentration at SP-2 in June 2007. TDS at most sampling locations ranged between 50 to 250 mg/l. During the 1989-1995 baseline period total suspended solids (TSS) ranged from <1.0 to 342 mg/l, and laboratory turbidity concentrations are in the range of <0.10 to 159 nephelometric turbidity units (NTU). During the 2006-2007 baseline period total suspended solids ranged from 1 to 51 mg/l.

At spring SP-1, SC and TDS concentrations are about 330 µmhos/cm and 215 mg/l, respectively. Spring SP-2 is located near a reclaimed leach pad in the Saddle Facilities Area, and has higher SC and TDS concentrations of approximately 2,000 µmhos/cm and 2,000 mg/l, respectively. Site SP-2 is not included as an ongoing monitoring station for the Golden Dream Mine Project; however, it is included in this discussion about water quality because some of its chemical constituents are relatively high for baseline conditions in the Project Area.

Nutrients

During the 2006-2007 monitoring period, nutrients in surface water were analyzed as nitrate+nitrite, Total Kjeldahl nitrogen (TKN), ammonia, total phosphorus, and orthophosphate. Nitrate+nitrite concentrations for the 2006-2007 period range from undetectable concentrations at the laboratory detection limits of 0.01 and 0.05 mg/l to 1.34 mg/l at SW-3 in May 2007. For those streams sampled, TKN concentrations range from 0.10 mg/l at most sites to 0.90 mg/l at SW-2 and SW-11. Ammonia was undetectable at the laboratory detection limit of 0.05 mg/l, for all but the June 2006 analysis at SP-2, which was 0.06 mg/l. Spring SP-2 had nitrate+nitrite concentrations of 23 to 63 mg/l in 2006-2007. Total phosphorus concentrations are from <0.01 to 0.34 mg/l, and orthophosphate concentration ranges from undetectable at the laboratory detection limit of 0.01 mg/l to 0.13 mg/l at all sites.

Common Ions

For streams in the Study Area during the period 2006-2007, alkalinity ranged from 29 mg/l to 260 mg/l at SP-2 in June 2007. Calcium concentrations for nearly all locations sampled ranged from about 10 to 100 mg/l, with most sites recording concentrations ranging from 20 to 40 mg/l, except for spring SP-2, which had calcium levels ranging from 300 to 400 mg/l. Concentrations of magnesium are less than 30 mg/l and sodium is less than 6 mg/l for most sites. Magnesium and sodium concentrations for SP-2 in 2006-2007 range from 36 to 50 mg/l and 100 to 200 mg/l, respectively. Potassium and chloride concentrations are <2 mg/l at all sites except SW-10, which had chloride concentrations between 6 and 9 mg/l. Sulfate is elevated at SW-10 ranging from 213 to 287 mg/l, and at SP-2 ranging from 990 to 1,120 mg/l, but is less than 70 mg/l at the other surface water stations.

Total Recoverable Metals

Concentrations of total recoverable metals from surface water monitoring sites in the Study Area during the 2006-2007 monitoring period are relatively low or below laboratory detection levels for the baseline monitoring periods. The following is a summary of selected metal concentrations for surface water monitoring stations in Table 13:

- Aluminum concentrations ranged from less than detectable concentrations (<0.03) to 1.69 mg/l; the highest concentration was measured at SP-1.

- Arsenic ranges from less than detectable concentrations (<0.001) to 0.045 mg/l; the highest concentration was measured at SP-1.

- Cadmium concentrations range from below or near the detection limit of 0.0001 mg/l to 0.01 mg/l at SW-10 (abandoned adit seepage in Greyback Gulch).

- Copper concentrations ranged from undetectable at several stations (<0.001 mg/l) to 0.804 mg/l at SW-10 in September 2006.

- Iron concentrations ranged from near detection (<0.03mg/l) to a maximum of 16.88 mg/l at SW-10.

- Manganese concentrations ranged from less than the detection limit of 0.005 mg/l to 4.84 mg/l. The secondary aesthetic human health criterion for manganese was consistently exceeded at SP-2, and SW-10, and two sampling events were exceeded at SW-2.

Based on metal concentrations at monitoring sites in the Study Area, site SW-10 (abandoned adit seepage in Greyback Gulch) generally had the most elevated metal concentrations. Elevated metal concentrations typically occur during spring runoff periods corresponding to relatively high stream flow rates.

Water Quality Standards

Exceedances of Montana water quality standards (Circular DEQ-7; DEQ 2006) for surface water stations listed in Table 13 are summarized in Table 15.

Table 15- Exceedances of Water Quality Standards for Surface Water Periods 1989-1995 and 2005-2007 Golden Dream Mine Project

Parameter	Montana Freshwater Aquatic Life Chronic Standard (mg/l)	Montana Human Health Standard (mg/l)	Surface Water Monitoring Site in Exceedances of Standard(s)
Aluminum	0.087-np	None	Most stations exceeded chronic standard in May/June 1995; highest value at SW-2 of 3.7 mg/l in 1990; highest value of 1.69 mg/l SP-1 July 2006.
Arsenic	0.15-pp	0.01	No sites exceeded the surface water chronic standard. Stations SW-2 and SW-10 exceedances range from 0.012 to 0.034 mg/l in 1989-1995; <0.001 to 0.045 mg/l during 2006-2007.
Cadmium	0.000097-h	0.005-mc	Chronic standard exceeded at stations, SW-1, SW-2, and SW-10; highest value 0.00029 mg/l at SW-2 during period 1989-1995; concentrations ranged from undetectable at most stations (<0.0008) to 0.01 at SW-10 in July 2006.
Copper	0.00285-h	1.3-pp	All stations except SW-11 have exceeded the chronic standard; concentrations ranged from undetectable at several stations to 0.804 mg/l at SW-10 in September 2006.
Iron	1.0-np	0.3*	Stations SW-2, SW-6, and SW-10 have consistently exceeded the secondary maximum contaminant level human health standard; several samples (SP-2, SW-2, SW-10) exceeded the aquatic life chronic standard; concentrations ranged from undetectable concentrations (<0.03 mg/l) to 16.88 mg/l at SW-10 in September 2006.
Manganese	None	0.05*	Concentrations ranged from less than the detection limit of 0.005 mg/l to 4.84 mg/l; SP-2 and SW-10 consistently exceeded the human health standard; highest value of 4.84 mg/l at SW-10 in July 2006.

Note: Only surface water stations listed in Table 13 are evaluated in this table.
mg/l = milligrams per liter; **np** = non-priority pollutant; **pp** = priority pollutant;
h = hardness dependent criteria (based on hardness of 25 mg/l);
mc = maximum contaminant level from drinking water regulation;
***** = secondary maximum contaminant level based on aesthetic properties of taste, odor, staining.
Source: Hydrometrics 2007; Maxim 1996; MDEQ 2006.

Elkhorn Creek data are not included in the monitoring stations listed in Table 13; however the quality of water in this stream is similar to the other streams discussed above. Elkhorn Creek has maximum alkalinity and hardness concentrations of about 190 mg/l. Some samples collected from Elkhorn Creek have exceeded human health and/or chronic aquatic life standards for lead and zinc, likely due to historic mining-related disturbances in the upper drainage area (Maxim 1996).

Groundwater Quantity

Groundwater monitoring in the Study Area was conducted during the same time periods as described above for surface water. Monitoring wells listed in Table 13 are completed in skarn, sedimentary argillite, and quartz monzonite. Groundwater movement in these rocks is primarily through secondary fracture openings, many of which occur along structural and lithologic contact zones. Shallow groundwater is present in unconsolidated alluvium along the drainage bottoms; however, these deposits are of limited extent in the Study Area.

Depth to groundwater measured in the Study Area monitoring wells varies from 16 feet to over 165 feet below ground surface. Water levels typically fluctuate 1 to 2 feet on an annual basis; however, fluctuations of over 10 feet have been recorded in wells MW-3 and MW-5 (Maxim 1996). Direction of groundwater flow in bedrock in the Study Area generally follows topography (Hydrometrics 2007). Results of aquifer testing in two dewatering test wells completed near the mine area are described in a later section.

Groundwater Quality

Six monitoring wells have been sampled and analyzed for constituents listed in Table 14. Two pumping wells used to dewater mine workings were installed in July 2005 (PW-3) and May 2006 (PW-4) (Figure 13). These wells were sampled and analyzed for constituents listed in Table 14 in August 2006. The following groundwater quality summaries are from Maxim (1996) and Hydrometrics (2007). Quality of water obtained from two dewatering test wells completed near the mine area is described in the Dewatering Wells section below.

General Parameters

Temperature of groundwater ranges from 4˚C to 9.6˚C. Field and laboratory pH values for the baseline monitoring periods of 1989-1995 and 2005-2007 are in the range of 6.6 to 8.3 s. u. Specific conductance of groundwater samples ranges from about 250 to 700 µmhos/cm. The redox potential is a measure (in volts) of the affinity of a substance for electrons, its electronegativity, compared with hydrogen (which is set at 0). Redox potential (Eh) was measured in the field during the monitoring periods, with a resulting range of 170 to 310 millivolts, indicating the groundwater system is in an oxidizing condition.

Nutrients

Nutrients in groundwater were analyzed as nitrate+nitrite, TKN, ammonia, total phosphorus, and orthophosphate. Nitrate+nitrite concentrations in groundwater during the baseline periods range from <0.05 to 1.9 mg/l. Ammonia concentrations are at or near laboratory detection limits of 0.05 mg/l at all wells. TKN is also at or near the laboratory detection limits of 0.10 and 0.20 mg/l at all wells. Orthophosphate concentrations range from <0.01 to 0.14 mg/l, and total phosphorus is in the range of <0.01 to 0.22 mg/l.

Common Ions

Groundwater in the Study Area is classified as a calcium-bicarbonate type with a hardness ranging from 135 to 420 mg/l, and TDS in the range of about 150 to 500 mg/l. Calcium concentrations range from 30 to 130 mg/l, and magnesium is from 9 to 25 mg/l. Sodium concentrations are less than 7 mg/l in all wells and potassium is at or near the laboratory detection limit of 1.0 mg/l. Reported sulfate values range from 5 mg/l at MW-2 to 112 mg/l at MTHG-B. Chloride ranges from <1.0 to 14 mg/l. Total alkalinity is from about 100 to 250 mg/l.

Dissolved Metals

Dissolved concentrations of aluminum, antimony, barium, beryllium, cadmium, chromium, copper, iron, lead, mercury, molybdenum, nickel, selenium, silver, and thallium are all near or below laboratory detection limits in groundwater samples collected during the baseline monitoring periods.

Concentrations of arsenic are at or near laboratory detection limits for all wells, with the exception of MW-7 (0.014 to 0.024 mg/l) and MTHG-B (0.012 to 0.014 mg/l). Well MW-7 is located in the town of Elkhorn, and MTHG-B is located near the unreclaimed mine pit and reclaimed leach pad in the Saddle Facilities Area (Figure 4). Over the two baseline monitoring periods, well MW-7 consistently had manganese concentrations ranging from 0.12 to 0.57 mg/l. Manganese concentrations in well MTHG-B ranged from 0.38 mg/l in June 1990 to less than 0.005 mg/l in the 2006 and 2007 sampling episodes.

Water Quality Standards

Groundwater analytical results for the two baseline monitoring periods show the following exceedances of Montana's human health standards (DEQ 2006):

- Well MW-7 exceeded the arsenic standard of 0.01 mg/l and the manganese standard of 0.05 mg/l. This well is located in the Elkhorn town area and is screened from 165 to 185 feet below ground surface.

- Well MTHG-B exceeded the arsenic and manganese standards. This well is located in the Saddle Facilities Area and is screened from 20 to 400 feet below ground surface.

Dewatering Wells

Two wells were installed in the portal/patio area of the proposed Golden Dream Mine Project to dewater mine workings as part of the approved bulk sample program. Well PW-3 was installed in July 2005 and completed to a depth of 440 feet. Well PW-4 was installed in May 2006 and completed to a depth of 572 feet. Long-term pumping tests were conducted in August 2005 for well PW-3 and in July/August 2006 for well PW-4.

The primary objectives for conducting pumping tests were to determine aquifer characteristics and hydraulic properties of the bedrock aquifer in the Study Area, and to evaluate the cone-of-depression created in groundwater by dewatering activities. The tests were also designed to provide data to assess the following issues related to mine development and operation:

- Long-term dewatering rates;
- Quality of discharge after sustained pumping;
- Effect of pumping on adjacent surface water flow;

- LAD system performance; and
- Infiltration capacity of soil.

In order to assess properties and characteristics of the bedrock aquifer, a long-term pumping test was necessary to substantially draw down the water table over time. Drawdown data collected during the pumping tests can be used to determine long-term dewatering rates of the bedrock aquifer necessary to maintain a water level below the mine workings. Water samples collected during the pumping tests are used to determine the representative quality of water in the bedrock aquifer, and the type and amount of treatment that may be necessary to discharge the water. Stream flow measurements were collected during the tests to identify any effects to surface water flow. Water pumped from the test wells was land applied by sprinkler sets and discharged into percolation ponds at various locations to determine infiltration rates and the storage capacity of soil in the Project Area.

Well PW-3 Pumping Test

A 25-hp submersible pump was installed in well PW-3 at a depth of 400 feet and pumped for 19 days at a constant rate of approximately 255 gpm. Water levels in the well dropped at a rate of 9 to 11 feet per day. Upon completion of the pumping test, water levels recovered at approximately 4 feet per day. Based on the recovery response during the test, well PW-3 appears capable of sustaining a long-term withdrawal rate between 100 and 120 gpm (Hydrometrics 2005).

Samples collected prior to the pumping test indicate that water quality is within regulatory limits for all parameters, with the exception of arsenic. Analytical test results show arsenic concentrations of 0.026 mg/l at the beginning of the test, and decreasing to 0.010 mg/l by completion of the test (human health standard is 0.010 mg/l). Arsenic concentrations trend towards regional surface water quality as the ore body is dewatered and water is pulled from surrounding geologic units (Hydrometrics 2005).

There was no change in surface water flow rates in the small perennial stream in Greyback Gulch during the PW-3 pumping test. This was anticipated since groundwater levels were below the streambed in this area at the start of the test (Hydrometrics 2005).

Hydrometrics (2005) projected the drawdown cone-of-depression around the pumping well for the 19-day pumping period. Drawdown of 100 feet or more occurred within a radius of about 150 to 250 feet from the test well, and 25 feet of drawdown from 250 to 400 feet from the test well (Hydrometrics 2005). Greater drawdown occurs over horizontal distance along the east-west axis, versus the north south axis. An observation well near Greyback Gulch (500 feet northwest of test well) had about 2 feet of drawdown at the end of the pumping period.

Well PW-4 Pumping Test

A 25-hp submersible pump was installed in well PW-4 at a depth of 555 feet and pumped for 12 days at a constant rate of approximately 215 gpm. Water levels in the well dropped at a rate of approximately 13 feet per day. The linear drawdown trend exhibited during the test is characteristic of the type of response produced when water is removed primarily from storage with comparatively low rates of regional recharge. Water levels recovered at about 30 percent of the drawdown rate (i.e., approximately 6 feet per day, gradually decreasing to 3 feet per day), suggesting an inflow rate over the recovery period of approximately 75 gpm. This recharge rate could decrease further after extended pumping, but is a reasonable estimate based on empirical data of the flow rate produced by the primary fracture system running along the trend of the ore body (Hydrometrics 2006).

Samples collected during the pumping test indicate that water quality is within regulatory limits for all parameters (Hydrometrics 2006).

Two temporary gauging stations were installed on the perennial stream in Greyback Gulch, upstream and downstream of well PW-4, to determine effects of dewatering on stream flow. There were no changes in surface water levels in Greyback Gulch during the test, indicating the aquifer tested is not connected with surface water in Greyback Gulch.

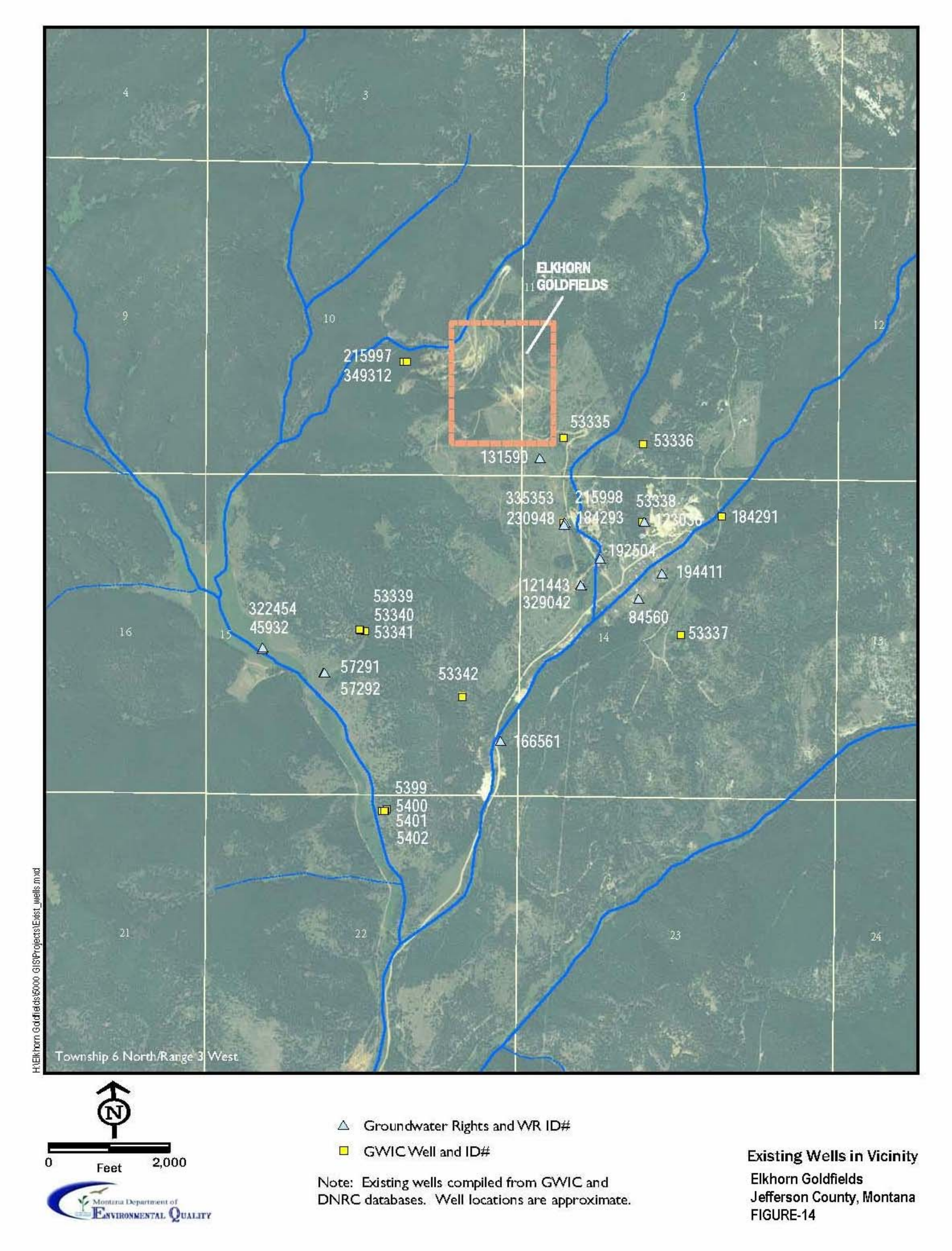
Infiltration Testing

Water pumped during the aquifer tests for wells PW-3 and PW-4 was pumped to eight percolation ponds at rates ranging from 5 to 83 gpm (Hydrometrics 2006). Four of these ponds had a combined average infiltration rate of 190 gpm, which is sufficient to meet the long-term dewatering rate of about 100 gpm. A design peak rate of 300 gpm would require additional percolation ponds.

Water Rights

Locations of groundwater rights listed by the Montana Department of Natural Resources and Conservation (DNRC) and wells listed by the Montana Bureau of Mines and Geology (MBMG) Ground Water Information Center (GWIC) are shown on Figure 14. Several surface water rights are also held for streams in the Project Area, including Elkhorn Creek, Slaughterhouse Gulch, Turnley Creek, and Sourdough Creek. Water rights information is obtained from the DNRC web site. Surface water and groundwater rights that exist in the Project Area are not expected to be adversely affected by the proposed Golden Dream Mine Project.

Figure 14-Existing Wells in Vicinity



NO ACTION ALTERNATIVE

Impacts

The Golden Dream Mine Project would not be developed. Surface water quality would continue to be impacted by historical mining and mineral development of the area. Stream restoration projects in this area would aid in repairing damage to surface water caused by historic mining, grazing, logging, and wildfire; however these impacts would still occur in this area. Groundwater quality in this area is impaired and would continue to be due to natural mineralization and historical mining influences.

PROPOSED ACTION

Impacts

Direct and secondary impacts to water resources could occur from the following mine-related facilities and activities:

- Water treatment and percolation ponds.
- Mine dewatering during mining.
- Mine flooding after cessation of mining.
- Native rock and non-ore rock used to construct the portal patio area.
- Development rock stockpile.
- Ore load-out area.
- Fueling station.
- Storm water runoff.

Water Treatment and Percolation Ponds

The underground mine workings would be dewatered using deep dewatering wells in proximity to the decline. This water would be pumped to an underground sump and then to a water treatment plant. The treatment system would be skid-mounted and would use adsorptive media of ferric oxide or ferric hydroxide product. Based on water quality analyses conducted during the dewatering well aquifer tests, arsenic may exceed standards and would be the focus of water treatment. In addition, any excess water collected in the underground workings would be first pumped to a nitrate bioreactor to reduce expected elevated nitrate concentrations from blasting compounds, followed by distribution to the arsenic treatment plant. Water from the treatment plant would then be pumped to the various percolation ponds for infiltration. Water may be discharged to land application areas on a limited basis to assist in reclamation (see Section 2.2).

Percolation ponds would be constructed to bedrock with dimensions of about 20 feet by 40 feet. Water would be pumped into the ponds at a rate and for such a time period as to let the pond naturally percolate the water into bedrock. Preliminary estimates of percolation rate range from 10 to 140 feet/day based on test pits (Hydrometrics 2006). It is expected that water would be pumped to the percolation ponds in rotation to ensure no one area becomes over-saturated and develops springs or overland flow. The long-term dewatering rate is expected to be about 100 gpm, with short-term peak rates of approximately 300 gpm (Hydrometrics 2006). Operation of these ponds during the winter may result in some icing problems. Quality of water pumped to the percolation ponds would be monitored routinely during the period of water discharge.

No adverse impacts would occur to groundwater quantity/quality as a result of water treatment and monitoring infiltration capacity of the ponds. In addition, the volume of water would not exceed the storage capacity of the ponds and would not affect surface water.

Mine Dewatering and Flooding

Mine dewatering would occur for a period of about 5 years, with an expected average long-term pumping rate of about 100 gpm (Hydrometrics 2006). Such pumping would draw down the groundwater level in bedrock around the pumping wells, with a cone-of-depression initially expanding around the wells until steady-state conditions are reached (i.e., recharge equals discharge). Pumping 255 gpm for 19 days at well PW-3 resulted in more than 25 feet of groundwater drawdown within a radius of 250 to 400 feet from the test well, reducing to about 2 feet of drawdown approximately 500 feet from the pumping well. Monitoring of water levels in wells in the project area, including some private wells in the town of Elkhorn, would be conducted routinely to observe any changes due to dewatering activities.

During pumping tests of wells PW-3 and PW-4, no changes in flow were observed in nearby Greyback Gulch. No impact to surface water from mine dewatering is expected. Monitoring would be conducted in Greyback Gulch and in groundwater between the stream and mine during mining.

After cessation of mining, the dewatering wells would no longer be used and the underground workings and decline would be allowed to flood with natural groundwater. This groundwater would rise to pre-mine water level conditions, submerging backfilled non-ore rock and most rock walls of the workings. Quality of this water would be monitored within and outside of the mine workings. Long-term quality of this groundwater is expected to be similar to existing baseline conditions (see Geochemistry section).

Portal Patio Area

The portal patio area would consist of a production portal and two ventilation portals, all connected by a patio constructed of native rock from the cut-and-fill, and if needed, some non-ore rock from the decline. Any runoff and/or seepage from this patio area would go to a nearby lined sediment pond (Basin-2). Water that collects in this pond would either be used in underground operations, or treated at the treatment plant, if necessary, and discharged to the percolation ponds.

Development Rock Stockpile

Construction of the Development Rock Stockpile in the Saddle Facilities Area of Slaughterhouse Gulch could result in impacts to water resources in that area. The rock would be placed in an unlined former mine pit that currently has actively oxidizing sulfide rock. Any runoff and/or seepage from this rock pile would go to a nearby lined sediment pond (Basin-4). Water that collects in this pond would be used in underground operations or treated at the treatment plant, if necessary, and discharged to the percolation ponds.

According to geochemical testing of the primary non-ore rock types for the Golden Dream Mine Project, arsenic released from the non-ore rock has potential to exceed primary drinking water standards. The quartz monzonite rock type has some potential to generate acid, which would be further evaluated using kinetic testing. With respect to existing groundwater quality in the Saddle Facilities Area, nearby monitoring well MTHG-B shows elevated arsenic (0.012 to 0.014 mg/l), and spring SP-2 (near the reclaimed leach pad) has elevated levels of nitrate+nitrite, sulfate, and TDS. These water quality conditions represent baseline conditions in some areas of the Project Site.

During reclamation, the rock pile would be graded to match the hillside to the extent possible at a slope of about 3.5H:1V. A compacted subsoil layer 6 inches thick would be first placed on the graded rock pile surface, followed by about 12 inches of topsoil, and then the soil would be revegetated.

Ore Load-out Area

The proposed Ore Load-out Area, located in lower Slaughterhouse Gulch, would be constructed with a concrete pad that would slope toward a lined sediment collection pond (Basin-10). The ore is stored on the pad temporarily until it can be loaded onto trucks for shipment to the Montana Tunnels Mine site. Any runoff from the ore pile that collects in the lined pond would be pumped for use in underground operations, or trucked to the water treatment plant in the Saddle Facilities Area for treatment, if necessary.

Fueling Station

The surface fuel station and fueling area would be constructed on a concrete pad as part of the office/shop building. This pad would be sloped to a containment sump that would contain 110 percent of the fuel tank capacities (two 13,000-gallon fuel storage tanks). A cover would be placed over the fuel station to prevent storm water from contacting the containment system.

Storm Water Runoff

Storm water from mine-related disturbance areas is to be managed as part of a Storm Water Pollution Prevention Plan in the site storm water permit issued by DEQ in April 2007 for the Golden Dream Mine Project. Sediment basins would be constructed throughout the Project Area to collect and retain storm water runoff. Three of these ponds or basins would be lined due to potential of mine drainage: Basin-2 would collect runoff from the haul road and Portal Patio Area; Basin-4 would collect runoff from the Development Rock Stockpile Area; and Basin-10, would collect runoff from the Ore Load-out Facility Area. Water that collects in these three lined basins would be used for underground operations, if possible, or delivered by truck to the water treatment plant located in the Saddle Facilities Area for final discharge to the percolation ponds. If storm water runoff exceeds the capacity of the ditches and/or ponds to contain the water volume, excess water with increased suspended sediment and turbidity could enter one or more affected drainages, including Slaughterhouse Gulch, Greyback Gulch, Turnley Creek, and Elkhorn Creek.

Water Rights

Surface water and groundwater rights that exist in the Project Area are not expected to be adversely affected by the proposed Golden Dream Mine Project. No discharges to surface water are expected from excess mine water. Storm water runoff from mining-related disturbances would be controlled using ditches and sediment ponds/basins constructed throughout the Project

Area. Pumping groundwater from dewatering wells near the decline and underground workings could lower the groundwater level in the vicinity of some existing wells. Quality of groundwater in the vicinity of existing water rights is not expected to be adversely impacted by the Proposed Action. Surface water and groundwater monitoring would be conducted in the Project Area to assure that impacts do not occur to existing water rights.

Monitoring

The Golden Dream Mine Project would use best management practices (BMPs) for controlling runoff onto and from mining-related disturbance areas. These measures would prevent erosion and sedimentation to natural drainages. Water treatment for arsenic and nitrate is included in the Proposed Action, with discharge of excess water to several percolation ponds.

Proposed ongoing water monitoring sites are shown on Figure 13 and summarized in Table 13. These monitoring sites are the same locations used by Hydrometrics (2007) during its 2005-2007 monitoring activities. Monitoring stations on Elkhorn Creek are not included in Table 13; however, these may be warranted during operations, especially at the confluence of Slaughterhouse Gulch and Turnley Creek with Elkhorn Creek. Water quality and quantity monitoring also would be conducted for excess mine water that is discharged to percolation ponds.

Proposed frequency for ongoing monitoring of both surface water and groundwater would be semi-monthly for the first three months of dewatering operations, monthly thereafter for the first year, and then quarterly for the remaining life-of-mine (Elkhorn Goldfields 2007). Water pumped to percolation ponds would be sampled at a frequency that depends on period of usage. Each pond that receives water would be sampled once per year, with up to four times per year for ponds that receive water on a regular basis. All water monitoring sites would be sampled and analyzed for the parameters listed in Table 14.

In addition to analysis of water quality, flow would be measured at surface water stations, and depth to water would be measured in the monitoring wells. EGI has proposed to install two flumes in Greyback Gulch upstream and downstream of the portal area during operations to monitor potential effects on surface water flow from mine dewatering. A new monitoring well may be installed between the mine and the Greyback Gulch stream channel to help evaluate groundwater and surface water interconnection. Additionally, baseline water quality samples would be collected from private wells located in the town of Elkhorn before mining begins (Elkhorn Goldfields 2007).

Storm water would be monitored according to the site's storm water permit which was approved by DEQ in April 2007. This permit may need to be amended to incorporate all proposed mine-related facilities if the project is approved. Monitoring would focus on several sediment basins that would be constructed throughout the project site, especially those basins that may be affected by mine drainage.

Cumulative Impacts

Historic mining, grazing, logging, and wildfires in the Study Area have resulted in some surface disturbance, with associated increased erosion and sedimentation to some of the drainages. The

Golden Dream Mine Project would control runoff from disturbed areas in accordance with a storm water permit from DEQ and thereafter would not add sediment to area drainages.

3.2.5 Geology

The Elkhorn Mining District is located at the contact of the Boulder Batholith quartz monzonite and several associated bodies of igneous rock of various compositions, with a mixed zone of sedimentary rocks, largely of the Paleozoic era. These Paleozoic rocks have been folded into a large anticline, trending about NNE to SSW, of which only the eastern limb is exposed in the district, the western limb having been largely engulfed by igneous rocks related to the Boulder Batholith. The eastern limb generally dips between 45-50 degrees to the east, though in areas near intrusions this dip can increase to 55-65 degrees. The interactions of these igneous rocks and the adjoining sedimentary rocks during the time the molten rock was emplaced into the sediments caused these mineral deposits to form. This juxtaposition of the southern contact of the Boulder Batholith against sedimentary rocks is unique to the Elkhorn Mining District, as both northeast and southwest along the contact of the Boulder Batholith the sedimentary sections are covered by large thicknesses of Elkhorn Volcanic rocks (TetraTech 2007).

Mineralization

Gold and gold-copper mineralization can occur as disseminated sulfide or magnetite mineralization within the endoskarn portions (the Gold Hill ore zone is of this type), as disseminated or podiform mineralization within reactive bedding of exoskarn units (the East Butte deposit is largely of this type), or as pods or vein-like masses of sulfide or magnetite mineralization right at the contact of the intrusive and sedimentary rocks (as at the Golden Dream deposit). In many cases the style of mineralization is complicated by being subjected to more than one episode of mineralization; such is the case with the Golden Dream deposit.

The Golden Dream deposit is formed at the contact of both diorite and quartz monzonite intrusive bodies and a large body of altered sedimentary rocks separated from the rest of the section by a protrusion of the Boulder Batholith quartz monzonite (TetraTech 2007).

Asbestiform Minerals

During exploration logging and sampling, no generally visible asbestiform minerals have been seen. Some minerals, such as serpentine, have been seen in their non-asbestiform varieties. Tests to look for asbestiform minerals were conducted as part of the development rock geochemical characterization (TetraTech 2007). These tests have shown no asbestiform mineral content.

NO ACTION ALTERNATIVE

Impacts

The No Action Alternative would produce no new impacts to the Elkhorn area's gold ore reserves. No ore would be removed, and there would be no new subsidence potential.

PROPOSED ACTION

Impacts

Direct and secondary impacts that could occur as a result of the Proposed Action on the geological resources of the area are:

- Surface subsidence due to collapse of underground workings
- Ore removal

Surface Subsidence

The underground workings involved in the Golden Dream Mine Project could cause instability and surface subsidence if they collapsed. Surface subsidence from collapsed workings is not a predicted effect of the Proposed Action due to geological stability calculations and proposed backfilling of the mine stopes (Figure 5 and 6) and portals (Figure 11). A total of 75,000 lcy of non-ore rock would to be extracted from the Golden Dream Mine Project. About 94,000 lcy of non-ore rock would be backfilled into the underground workings.

Ore Removal

The direct impact on the geology of the area is the removal of gold ore. Gold ore removed from the proposed Golden Dream Mine Project represents a loss of resources to the mineable and ore prospects of the Elkhorn area, although the products made from the gold could be expected to be in service indefinitely.

Monitoring

EGI would be performing geologic mapping, including the mapping of fractures and fracture sets, rock quality measurements, and roof bolt pull tests as development progresses underground. Areas with particular stability issues would be noted and additional ground support would be put in place as necessary.

Areas that would have potential stability issues would be development areas close to the surface, and mine stope areas. Geologic mapping would identify areas in the development that may have subsidence issues and these areas would be planned for backfilling at reclamation. As development progresses below about 100 feet from the surface, based upon stability calculations a complete collapse of the decline would not lead to any subsidence at the surface.

For the stoped areas, the oxide zones would be backfilled using a combination of rock from the underground workings and cement. This would serve as a solid 190 foot thick crown pillar to prevent subsidence. The sulfide ore zones would be partially backfilled using rock from underground to prevent subsidence.

Prior to commencing mining, EGI would begin a surface subsidence monitoring program to measure ground movements on the surface. This program includes installation of non-movable points on private and USFS ground that would be measured and recorded by survey on a quarterly schedule. Four initial points have been identified to start this program, one over the main decline, one over the ventilation decline, one over the spiral portion of the decline and one over the ore body in the location of the oxide ore zone/crown pillar backfill (Figure 3). Data would be collected, recorded in a database, and analyzed after each surveying event to monitor for ground movement or surface subsidence (Elkhorn 2007).

Cumulative Impacts

There are no expected cumulative impacts to subsidence from the proposed action.

3.2.6 Soil

The soils of this area have been described in the baseline soils investigation by Hydrometrics Inc, 1994. These soils can be deep (more than 50 inches to bedrock) or lithic (less than 20 inches to bedrock) and most are skeletal with more than 30 percent rock fragments. Salvage depth for all soils in the sampled area ranges up to 36 inches. There are no soil salvage limitations based on sampled pH. The acid base account for the Elkhorn area soils suitable for salvage ranges from 7 to 732 tons of calcium carbonate per 1,000 tons of soil. This is desirable from a reclamation standpoint as these would provide suitable cover for possible acid forming non-ore rock materials that may be produced during any mining operations. Area soil has been found suitable for LAD of treated mine waters or process waters. Analysis has found that the soil has the capacity to attenuate cations of ammonium or metals (Hydrometrics 1994).

NO ACTION ALTERNATIVE

Impacts

Disturbances by the permitted EGI exploration plan have already occurred on 6.9 acres. Reclamation of these disturbances would occur as part of Exploration License #00617 requirements. The Mount Heagan Pit would not be reclaimed.

PROPOSED ACTION

Impacts

The soils on the proposed disturbed areas would be impacted by the Proposed Action. Proper soil salvage and reclamation would speed the recovery of this area after the proposed disturbance, but the affected areas' soil development would be forever changed.

The Mount Heagan Pit area is an unreclaimed disturbance feature of past mining; the Proposed Action would fill in this pit and reclaim it as part of the natural hillside. Future soil development in this area would be benefited as a result of the Proposed Action.

Monitoring

A DEQ approved reclamation plan would be a part of any permit approval. This plan would be evaluated on its ability to return the area to a similar predisturbance ecological capability. Soil salvage and proper reclamation would mitigate proposed disturbances. The DEQ would hold a reclamation bond on the proposed disturbance areas that would cover the costs of reclaiming the disturbed area.

Cumulative Impacts

Over the long term, reclamation would return the proposed disturbance areas to similar pre-disturbance states and in some cases would reclaim old unreclaimed disturbances from past mining. Over the short term, the cumulative impacts to area soils would be an increase in disturbances to soils already affected by past mining, grazing, wildfire, and timber harvesting.

3.2.7 Vegetation

Vegetation is predominantly coniferous forest with Douglas-fir, subalpine fir, or lodgepole pine in the forested areas. Deciduous forest, primarily cottonwood or aspen, is found along drainages at lower elevations. Merchantable timber on the project area has been logged (WESTECH 1995).

An update of vegetation inventories including: Sensitive Plant Species, Noxious Weeds, Vegetation Types, and Wetlands was conducted by WESTECH Environmental Services, Inc. in 2006. Of the 16 plant species listed as sensitive in the Montana Natural Heritage Program database for the Project Area, five of which are listed as sensitive on the USFS list, none has been encountered in previous studies of the area, and none was encountered in the field reconnaissance. In addition, suitable habitat is not available for these sensitive species. The majority of proposed mining disturbance occurs on vegetation types that have been disturbed by logging, grazing, or previous mining. Noxious weeds have increased in the project area since 1993 as a result of logging on the patented claims (WESTECH 2006).

In the area of the Proposed Action, the forests have many red conifers that have been killed by bark beetles or injured by western spruce budworm. More than 100,000 acres of the Helena National Forest have trees affected by bark beetles or budworm since 2003. Bark beetles and budworm are a natural part of the forest and normally kill or injure the weakest trees, giving the stronger trees more room to grow. Drought and stand conditions (tree size and age) have made many trees weak. Some tree species are more abundant and susceptible to these insects. Bark beetle and budworm populations have grown in response to this increased availability of food and warmer winters. The largest groups of defoliated and dead trees are east of Townsend, north and south of Hwy. 12, and northwest of Lincoln, north of Hwy. 200. There are also patches of red trees scattered throughout the remainder of the Helena National Forest (http://www.fs.fed.us/r1/helena/resources/insects_diseases/trees_many_colors.pdf) The area of the Proposed Action has been logged to avoid wildfire and beetle infestation problems. (Thomas Smith, 2008 personal communication to Lisa Boettcher.)

NO ACTION ALTERNATIVE

Impacts

The No Action Alternative would cause no new impacts to area vegetation.

PROPOSED ACTION

Impacts

Vegetation on less than 30 acres would be disturbed as a result of the Proposed Action. There are also secondary impacts to vegetation from increased road dust and an increase in weed infestations due to disturbance. Dust control would be implemented as part of an Air Quality permit and County Road Agreement. Weed control would occur on EGI property as part of the Jefferson County Weed Management Plan and EGI's commitment to weed control as part of the proposed reclamation plan.

Monitoring

Disturbed areas would be reseeded with the approved seed mix and monitored for reclamation success. Areas of reclamation that do not establish vegetation would be reseeded.

Cumulative Impacts

There are no expected cumulative impacts to vegetation from the Proposed Action

3.2.8 Sound

In 1993, a baseline sound investigation was performed by Hydrometrics, Inc. On October 5, 1993, at 2:00 p.m. in the town of Elkhorn with mining activity at the core shed, core drilling activity at East Butte, and historic structure renovation with a skid-steer loader running, a 10-minute average dBA of 48.4 was measured in Elkhorn. The same day at 12:08 p.m. during a moment of peak drilling activity at the East Butte site, with measurements taken 50 feet away from the drill, sound events for a 10-minute time period averaged 76.2 dBA.

On October 11, 1993, in Elkhorn, with no apparent mining activity, but with building renovation occurring at Elkhorn, the 10-minute averaged sound level was 34.7dBA. The same date, near Queens Gulch, a 10-minute averaged reading of 47.7 dBA due to creek flow and rain was recorded.

On October 25, 1993, in Elkhorn, at 6:30 a.m. (considered nighttime) a 10-minute averaged reading of 32.1 dBA was recorded. During the same day at 6:50 a.m., a 10-minute averaged reading of 39.2 dBA was recorded with most noise due to hunter traffic.

Although the populations of Jefferson and Lewis and Clark counties have increased in the last 15 years, the population of Elkhorn has remained stable since the period of the survey. Therefore, these baseline noise activity levels should be applicable for analysis of the Proposed Action.

NO ACTION ALTERNATIVE

Impacts

Residential and recreational traffic and logging would continue to cause noise impacts.

PROPOSED ACTION

Impacts

The Golden Dream Mine Project would generate sound levels above the ambient sound levels for the town of Elkhorn. Haul road traffic and initial blasting activities represent the most persistent and loudest examples of expected mine sound. As the mine moves farther underground, the noise from blasting would be reduced, and most noise would come from the haul trucks.

Monitoring

A sound sampling regime has been proposed by EGI, and a maximum, at any duration, limit of 85 decibels has been set for in-town noise. A running lawn mower puts out about 90 dBA. Any noise level 85 dBA and higher can cause hearing damage at prolonged periods. The standard set by the National Institute of Occupational Safety and Health (NIOSH) is constant exposure to 85dBA for 8 hours will result in permanent hearing loss (www.cdc.gov/niosh). At any exposure above 85 dBA, hearing protection is recommended. Four separate noise level sampling events would be conducted in the town of Elkhorn before mining begins. As an ongoing program, noise levels would be measured once per month during mining. Construction work would be kept to daylight hours only. Mining would be conducted 24 hours per day, 7 days per week. Use of engine decompression (jake) brakes would be controlled by speed limits for equipment leaving the property (Elkhorn 2007).

Cumulative Impacts

Additional projects such as ongoing logging and recreational traffic would add to the mining noise generated by the Proposed Action.

3.2.9 Socio-Economics

On July 1, 2006, Boulder had an estimated population of 1,445. (U.S. Census 2007). For all of Jefferson County total employment was estimated at 4,608 jobs (2000), total personal income at $267 million (2002), and budgeted expenditures at $6,417,751 (fiscal year 2003). Total county-wide assessed valuation was over $526 million with a taxable value of almost $20 million. The taxable value of net and gross proceeds was just over $2.5 million (Ramey 2004). Mill rates vary by area based on school and other special district assessments.

In 2000, Jefferson County median household income was $41,506 (U.S. Census 1997). In 2002, Jefferson County residents had a per capita personal income of $25,696, which was 103 percent of the 2002 Montana average of $24,831 and 83 percent of the 2002 U.S. average of $30,906. In 2002, Jefferson County residents earned a total personal income of about $267 million, which accounted for 1.2 percent of the state total. This was up from about $240 million total personal income for Jefferson County in 1999 (U.S. Bureau of Economic Analysis 2004). The average wage per job in Jefferson County was $27,117 in 2002, which was 105 percent of the 2002 Montana average of $25,790, and 75 percent of the 2002 U.S. average of $36,167 (U.S. Bureau of Economic Analysis 2004a).

The U.S. Census Bureau estimated that there were 4,213 housing units in Jefferson County in 2005. Data from Census 2000 show that Jefferson County had 3,747 households, a homeowner vacancy rate of 11 percent, and an average of 2.62 persons per household. The home ownership rate was 83 percent. The median housing value was $128,700 and 55 percent of the population had lived in the same house since 1995. None of the communities in the northern portion of the county is incorporated, and the community facilities and services available are provided by special districts or Jefferson County.

Total employment in 2000 was estimated at 4,608 jobs in Jefferson County. Mining accounted for 7.5 percent of the employment and has seen one of the highest percent growth rates since 1970 (811 percent). Other fast growing categories under Services and Professional are: services (which includes health, business, legal, engineering, and management services at 23 percent of total employment in 2000) and retail trade (accounting for 15 percent of total employment in the tourism industry).

The impact of Golden Dream employees, 70 at maximum, would be felt mostly in the town of Boulder. This is the nearest town with services and with significant housing available. The town of Elkhorn does not presently have services, nor a significant amount of vacant housing. The 70 employees, if they all resided in Boulder or near Boulder and were all new workers form the outside, would represent only a small fraction of Boulder's total population. If each employee brought one other person with them, a total of 140 new arrivals, they would represent a larger fraction, just under 9.7% of Boulder's total population. Despite this small number, it would pose some impacts on local schools, police and services in the short-run (the first 12 months) due to the sudden arrival of these new people all at once.

There is good reason to believe, however, that these impacts would not be significant in the long-run and would be easily absorbed over the first few months of mine operation. The estimated growth in population in Boulder from 2000 to 2006 was 145 persons, slightly larger than the maximum 140 new persons that the mine could potentially bring into the area. Also, it is very likely that some hired for the mine would be locals who already live in the area. If half of new hires for the mine were local, then impacts on services of newcomers would be cut in half. Some of the workers moving in from elsewhere would probably reside outside of Boulder, and use the services in Boulder. A few might locate near Helena, Butte or Whitehall, and not use services in Boulder. Finally, the impact would depend in part on perception of the local population. New employment opportunities would likely be welcomed in Jefferson County, a county long associated with mining. Also, residents would welcome new tax revenue that the mine and its workers would have to pay.

Most impacts from the mine would be felt by the town of Boulder and in Jefferson County as a whole. Some tax benefits would go to the State of Montana, and would be insignificant on a statewide level. Beneficial impacts that would occur to the area would include new jobs, new income above what was being made before the mine, and new local and state tax revenue as a result of mining operations. It is likely that in any given year of mine operation, new jobs and income would be less than 2% of total jobs and income in the county. Thus, the beneficial impact of jobs and income countywide would likely be insignificant, but could be more significant for the town of Boulder. The tax impact would be greater on Jefferson County and Boulder due to mine-related taxes on the company (e.g. Metal Mines tax, Gross Proceeds tax), and would likely be significant once the mine started operating. Based on the Montana Tunnels EIS of 2008, schools and county funds would benefit the most from mine-related taxes with much of the benefit going to Boulder. Local businesses would get a small boost from the spending of both the mine and its employees.

Negative impacts could also be felt in the area, although they are likely to be insignificant due to the smaller size of the mine. In terms of housing for the new workers, if Boulder has the county average of persons per household (2.62), and the county average vacancy rate (11%), then about 60 vacant residences would be available in town ((1,445/2.62)*0.11). This would not be enough for 70 new families, but likely some of the 70 workers will already live in town (thus not needing new housing), and other incoming families could build something new, or live outside of town, but still within commuting distance. New people coming to town could create new social opportunities and new social tensions as well, with newcomers potentially bringing different values with them. The other services in town should be able to adjust to a 9.7% or less population increase, even a sudden one, within a year. New tax dollars from the mine and its workers could pay for most or all of needed new services, although there might be a lag between needed services and incoming new tax dollars. Overall, the long-run positive and negative impacts are expected to be insignificant, with the exception of mine-related tax revenues.

Jefferson County is one of the fastest growing counties in Montana, growth that is spurred by in-migration of retirees and families focused on the quality of life rather than the need for employment opportunities in the immediate environs. Community life is focused on schools and recreation opportunities. Jefferson County is growing quickly, especially in the northern part of the county that borders the city of Helena. The latest information from the U.S. Census Bureau is that Jefferson County has a population of 11,256 as of July 1, 2006 up from 10,085 on July 1, 2000.

Mining of all types plays a greater role in Jefferson County's economy than it does for the state. Jefferson County's largest industries in 2000 were mining (all types), which accounted for 26.6 percent of total earnings by place of work. In Montana, mining accounted for 1.2 percent of all employment in 2002 (U.S. Bureau of Economic Analysis 2004). Jefferson County depends upon mining for 8 to 19 percent of its economy. The Golden Sunlight Mine (GSM) and Montana Tunnels are the other major metal mining operations in Jefferson County (Draft Montana Tunnels EIS, January 2008).

Jefferson County has many natural resources, and the economy is based around production agriculture, wood products, and mining. There are two large mines, one at each end of the county. GSM is located approximately 1.5 miles off Interstate Highway 90 at State Highway 69, near Whitehall. It is an open pit predominantly gold mining operation that employs about 157 persons with 22 contract workers. GSM would be currently permitted through 2012 (DEQ/BLM ROD 2007).

The Montana Tunnels Mine is located approximately 7 miles from Jefferson City. The mine currently produces 11,000 to 20,000 tons of ore per day. Since the mine began production in 1987 it has produced 1.5 million ounces of gold, 28.0 million ounces of silver, 390 million pounds of lead and over 1 billion pounds of zinc. The Montana Tunnels Mine is currently proposed to be permitted through 2013 and provides $2.5 million in annual wages (DEQ/BLM EIS 2008).

Another natural resource related business is the Ash Grove Cement Company located near Montana City. Ash Grove, with an 83-person workforce, mines limestone, silica, alumina, and iron and produces bulk cement (Jefferson County 2007).

The Golden Dream Mine Project, as proposed by EGI, would employ a maximum of 70 employees. The expected payout of salaries ($28 million) and taxes ($17 million) over the life of the proposed Golden Dream Mine Project would total $45 million, or $9 million a year (personal communication Shane Parrow, EGI 2008). EGI has made the commitment in the permit application and to local community leaders through public meetings to hire and train as much local help as possible. EGI has also committed to provide funds to improve the Elkhorn county road and to provide assistance in fire fighting and utilities acquisition for the residents of Elkhorn.

NO ACTION ALTERNATIVE

Impacts

The No Action Alternative would result in the denial of the Proposed Action; there would be no economic benefits gained by the local and state communities from the proposed gold mine. A workforce would not be hired to mine and ship the gold as described in the Proposed Action. Wages and benefits gained from 4-5 years of employment and training would not be received by prospective employees. An increase in total county industry wages by 16 percent would not occur as a result of the Proposed Action.

PROPOSED ACTION

Impacts

The local economy would see increased revenue due to the Proposed Action. An increased tax base would benefit both local and state governments. Training and employing up to 70 employees for the proposed Golden Dream Mine Project would impact the economy of Jefferson County and Montana in a beneficial way due to wages and salaries paid out and the indirect services paid for by these employees, such as housing, food, and education. The addition of wages and taxes created by the Proposed Action would account for a significant increase in mining industry wages and total industry wages for Jefferson County.

Cumulative Impacts

Mining generated wages for Jefferson County accounted for $ 15,744,892 in 2007or 28 percent of all county industry wages ($55,426,431). Employment for the mining industry as of 2007 is listed at 311 persons. Income generated from the present day mines has given the county opportunities to expand other businesses (Jefferson County 2007).

4.0 CUMULATIVE IMPACTS

Introduction

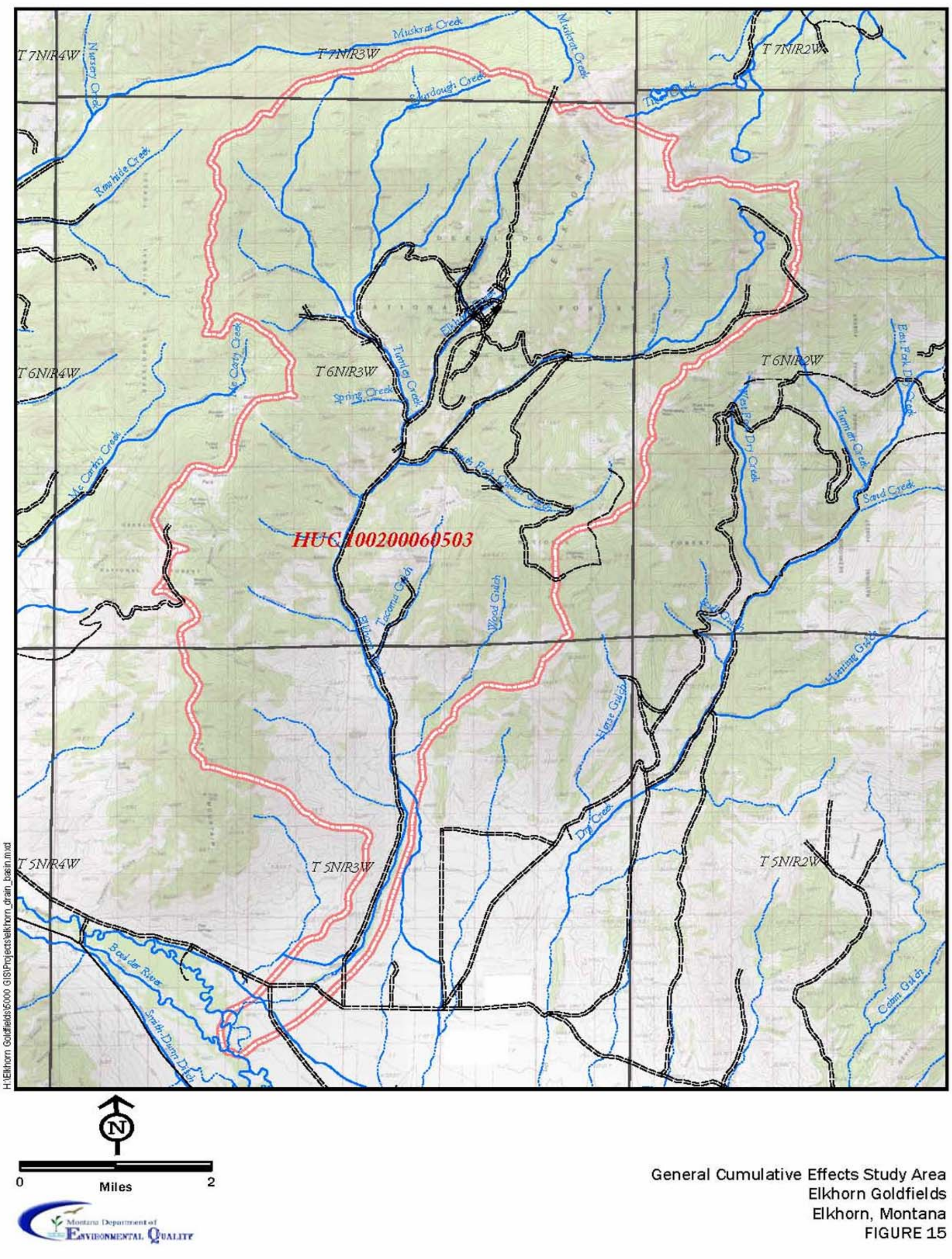
Cumulative impacts are "the collective impacts on the human environment of the Proposed Action when considered in conjunction with other past, present, and future actions related to the Proposed Action by location or generic type" (75-1-220(3), MCA). Related future actions may only be considered when these actions are under concurrent consideration by any agency through pre-impact statement studies, separate impact statement evaluations, or permit processing procedures (75-1-208(11), MCA).

This chapter presents descriptions of the collective impacts of combining past, present, and future actions associated with mining and land uses in the vicinity of the Golden Dream Mine Project. Each resource analysis in this section begins with a description of the geographic area considered to be the "Cumulative Impacts Study Area" for that resource and the rationale for the designation. The Cumulative Impacts Study Area (Study Area) is typically a unique geographic area specific to individual resources.

Past, Present, and Future Actions
Land uses in the vicinity of the Golden Dream Mine Project include the following general categories:

- Mining and Mineral Development
- Recreation
- Wildlife Management
- Habitat Restoration Projects

Figure 15- General Cumulative Effects Study Area



4.1 MINING AND MINERAL DEVELOPMENT

Past and Present Actions

The Elkhorn Mining District was prospected early in the history of the State and numerous quartz locations were made in the years preceding 1870, but the district did not attract attention until silver was discovered on the Holter Lode Claim at the north end of the Elkhorn town site. The A. M. Holter Lode (later known as the Elkhorn Mine) became a producing mine around 1875 and was the principal producer of the district, and was for many years one of the prominent silver mines in the country. In addition to silver mining, several gold mines were active throughout the early history of the District, including the East Butte Area, Carmody Area, Sourdough Area, and the Montana Claim. Historic mine disturbances including adits, shafts, rock dumps, tailings, and prospects are common throughout the District.

The town of Elkhorn was established to service the mines, and during its peak the town's population reached over 1,000 people. Elkhorn was connected to the Northern Pacific Railway by a spur line from Boulder constructed in 1887. A series of mills evolved at Elkhorn to handle the increasingly complex ores. After the arrival of the railroad, the Elkhorn and other mines, such as the C & D, Elkhorn, Queen, and Dunstone, shipped ore and concentrates to the smelter in East Helena. In 1891, the District was producing at a rate of $1 million a year. The Holter Mine produced ore continuously until 1900. Fluctuating silver prices caused several closures of the mine until 1951, when it was operated briefly for the last time.

In the 1980's, modern exploration began in the Elkhorn Mining District when Gold Fields Mining Corporation initiated a drilling program concentrating on various gold mines and prospects in the District. The drilling identified several areas of gold skarn mineralization, including significant deposits in the Sourdough/Golden Dream, Mount Heagan/Gold Hill, East Butte, and Carmody areas. Gold Fields Mining Corporation, and subsequently Santa Fe Pacific Gold Corporation, that inherited the property through a series of exchanges, examined several alternatives for mining the deposit and had concentrated on a combination of three open pits and a small underground program to develop the deposits. Santa Fe Pacific Gold Corporation was in the process of developing this alternative when in 1996 it was purchased by Newmont Mining Corporation which decided the property did not fulfill its corporate strategy for development projects. Treminco Resources Limited then obtained the property from Newmont Mining Corporation and subsequently became Elkhorn Goldfields, Inc.

The abandoned mine inventory compiled by DEQ's Remediation Division identified 32 sites in the Elkhorn Mining District. Seven of these sites are listed as high priority and comprise approximately 109 acres of disturbance.

Future Actions

There are presently no future mining development projects beyond what is proposed for the Golden Dream Project in the Elkhorn area.

Proposed Action

Past mining has disturbed the land of the Elkhorn area. Short term cumulative impacts to the area through disturbance from the Golden Dream mine would be expected. Long term cumulative impacts would be mitigated through successful reclamation of disturbed areas as proposed.

4.2 RECREATION

Past and Present Actions

Elkhorn State Park lies within the privately owned town site of Elkhorn about one-half mile southeast of the proposed Golden Dream Mine Project. The Park consists of two buildings, Fraternity and Gilliam Halls, which are listed on the National Register of Historic Places and recorded in the Historic American Buildings Survey. These two structures from the early-day silver-mining town have been preserved as outstanding examples of frontier architecture. The town of Elkhorn has been called one of the most important historical sites in the West and offers visitors a look into the 19th century mining landscape. Numerous other structures in the town are under private ownership and in various stages of decay, fallen down, or have been dismantled and recycled. A small picnic area for day use is located at the south entrance to Elkhorn on public land administered by the Beaverhead-Deerlodge National Forest.

The Elkhorn Cooperative Management Area offers over 120 miles of non-motorized trails and 334 miles of motorized trails and roads for access and exploration. Recreation in the area is managed by USFS, BLM, and Montana Fish, Wildlife and Parks in accordance with the Elkhorn Mountains Travel Management Plan. Public land in the area has been and continues to be used for recreation activities including hiking, hunting, fishing, biking, sightseeing, snowmobiling, cross-country skiing, and off-road vehicle use.

Access to the Project Area is by County Road No. 258 from its intersection with Montana Highway 69 about 7 miles south of Boulder. The County road is primarily used to access the Elkhorn town site or other historic sites and trailheads in the area. Information concerning use of County Road No. 258 was obtained as part of a survey conducted for Santa Fe Pacific Gold Corp. during the period of October 1993 through March 1994. Results of the survey indicate that the Elkhorn town site was the most common destination. Pass through traffic to areas beyond Elkhorn was minor. Although the populations of Jefferson and Lewis and Clark counties have increased in the last 15 years, the population of Elkhorn has remained stable. Because the Elkhorn town site was the most common destination for users of County Road 258, these data are still applicable to the Proposed Action.

Other recreation related activities include:

- Projects by the USFS to reconstruct and relocate trails to enhance accessibility and avoid private property;

- USFS surveying and designing approximately 5.5 miles of trail from the town of Elkhorn to the Muskrat trail to avoid private land;

- Joint effort between BLM and USFS on road stabilization projects in the Elkhorn Mountains.

Future Actions

Recreational activities would continue at current levels in the area. Travel on National Forest and BLM roads is in accordance with Elkhorn Mountains Travel Management Plan. Projects included in the Elkhorn Implementation Group Program of Work would likely continue as reasonably foreseeable future activities depending on availability of funding.

Proposed Action

EGI has entered into an agreement with Jefferson County to upgrade County Road No. 258 from the junction with State Highway 69 to the Elkhorn town site. The majority of public concerns expressed in the DEQ's initial scoping involve Elkhorn road safety. EGI has committed to the above road agreement in order to properly address these concerns. Unavoidable cumulative impacts could occur to recreational traffic from haul truck use of the Elkhorn road. Increased traffic and road construction would increase the potential for road hazards over the short term.

4.3 WILDLIFE MANAGEMENT

Past and Present Activities

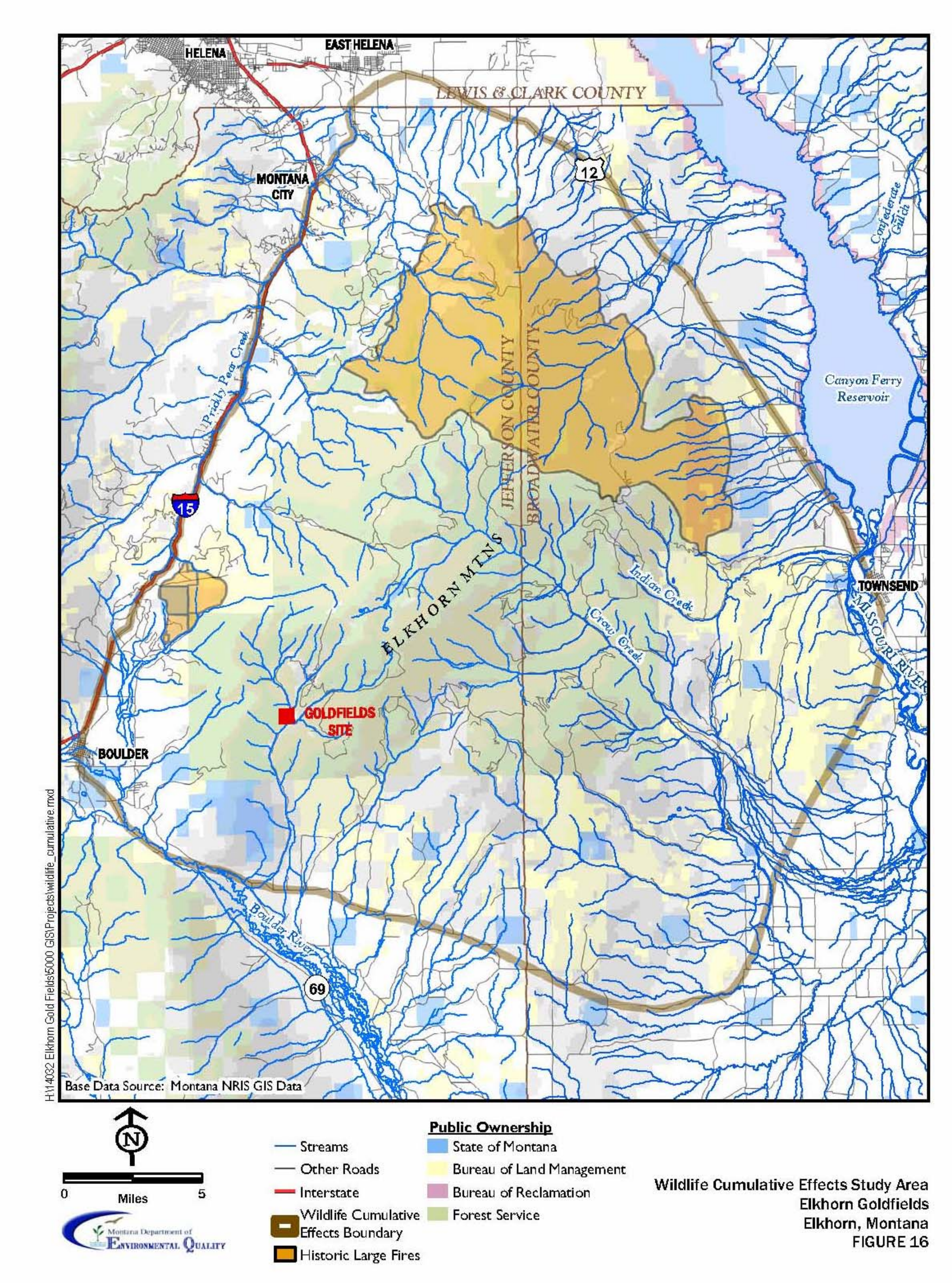
The Elkhorn Mountains are managed in partnership with the Beaverhead-Deerlodge and Helena National Forests, the Butte Field office of BLM, and Montana Fish, Wildlife and Parks as the Elkhorn Cooperative Management Area (Figure 16). In 1992, these agencies agreed to cooperatively manage all federal public land in the Elkhorns with emphasis on management of diverse and healthy wildlife and fish habitats. An Elkhorn Working Group consisting of about 20 private citizens and agency representatives was formed to develop collaborative recommendations related to wildlife/livestock management strategies in the Elkhorns. Projects completed by the agencies in the Crow Creek and Indian Creek drainages include acquisition of the Iron Mask Ranch, reintroduction of bighorn sheep, and stream restoration of a portion of Indian Creek.

Bighorn sheep were transplanted into the Indian Creek/Crow Creek area of the Elkhorn Mountains in the winters of 1996, 1997, and 2000. These sheep have successfully reproduced and have established primary winter ranges in the Crow Creek and Indian Creek drainages. Some sheep are present in the Study Area year-round. Wintering bighorn sheep may occur anywhere in the Study Area, but are most often associated with limestone ridges and mountain mahogany/shrub habitats (MTARNG/BLM 2007). Currently, an estimated 120 bighorn sheep are located on and around the Crow Creek/Indian Creek drainages. The population goal is 250 animals, indicating that the estimated capacity of the range to support bighorn sheep has not been reached.

Update: An article by reporter Eve Byron published in the Helena Independent Record on 4/11/08 states that there has been "an all-age die-off" of the majority of bighorn sheep in the

Elkhorns due to pneumonia contracted through contact with domestic sheep. The future viability of the Elkhorns bighorn population is currently in doubt.

Figure 16-Wildlife Cumulative Effects Study Area



Other wildlife management related projects in the Elkhorns include:

- Elkhorn Mountains Westslope Cutthroat Trout Restoration Program - a cooperative effort supported by Montana Fish, Wildlife and Parks, Helena National Forest, BLM, and Montana Trout Unlimited to reintroduce westslope cutthroat trout to selected streams throughout the Elkhorn Mountains;

- Various habitat restoration projects have been implemented to enhance or reclaim habitat for selected species on lower Elkhorn Creek approximately one mile below the town site.

Proposed Action

No bighorn sheep have been sited on or near the proposed permit area for the Golden Dream Mine. There are no predicted cumulative impacts to wildlife as a result of the Proposed Action.

4.4 HABITAT RESTORATION PROJECTS

Past and Present Actions

As a first step toward management of the Elkhorn ecosystem, the BLM, USFS, and Montana Fish, Wildlife and Parks undertook a landscape level inventory of the components and a study of the landscape level changes. The Landscape Analysis, completed in 1992, provided the agencies a common vision and a solid foundation for establishing overall annual work priorities. Each year the Implementation Group develops a program of work for approval by the Elkhorn Steering Committee.

Since its inception in 2006 the Elkhorn Implementation Group has completed numerous projects, some of which are ongoing (BLM/MDFWP/BDNF/HNF 2006). A summary of habitat restoration related projects includes:

- Elkhorn Initiative – a cooperative BLM, USFS, and Montana Fish, Wildlife and Parks effort coordinated with the Rocky Mountain Elk Foundation to enhance wildlife habitat in the Elkhorns through land adjustments, habitat projects, and acquisitions. They coordinate with private landowners to enhance bighorn sheep and elk habitat in order to reduce impacts of wildlife on private land. Ongoing projects include prescribed burns, fence and water development projects, and noxious weed treatments.

- Grassland and Riparian Restoration Projects to remove young conifers along the grassland and parkland interface. These include removal of trees near riparian areas that act as barriers to livestock and helping to restore riparian vegetation (willow and alder communities);

Future Actions

Habitat restoration projects undertaken by USFS and BLM would involve management of vegetative communities including grassland, shrubland, forests and woodland, riparian vegetation, and noxious weeds. Most of the projects developed by the Elkhorn Implementation Group (listed above) would likely continue.

Proposed Action

Some short term cumulative impacts to the areas land can be expected from the Proposed Action. However, EGI has committed to reclaim several historic mine disturbances (Mount Heagan Pit etc.) as part of their proposed reclamation plan. This would result in a long term benefit to the area.

5.0 REGULATORY RESTRICTIONS ANALYSIS

Under MEPA, state agencies must disclose any regulatory impacts on the applicant's private property rights. Since DEQ does not propose other alternatives or additional conditions, a regulatory restrictions analysis is not needed.

6.0 CONSULTATION, COORDINATION, AND PREPARATION

Legal Notice and Press Release upon Receipt of Application

DEQ sent out a legal notice to be published in the Boulder Monitor, Helena Independent Record, Montana Standard, and Boulder Monitor on May 7, 2007. DEQ also issued a press release upon receipt of the application for an operating permit. The press release went to the major dailies (Butte, Helena, Billings, Great Falls, and Missoula) as well as local papers (Jefferson County Courier, Whitehall Ledger, Queen City News, and Boulder Monitor) and the State of Montana Newslinks service. Seven letters and e-mails were received by the DEQ. Issues raised by the public are presented in Table 1. The application from EGI was also placed on the DEQ website.

Deficiency Letters

DEQ reviewed the operating permit application and issued three deficiency letters on June 8th, November 5th and December 13th of 2007. EGI responded to the agency's comments, amended the application, and the application was called complete enough to start the EA process on December 13th.

Legal notice and press release upon release of EA

DEQ will publish another legal notice and press release when this EA is released. The Draft EA is available on the DEQ website.

EA reviewer and preparers
Lisa Boettcher, BS, Geology; MS, Geology and Geological Engineering
Jim Castro, BS, Chemistry; MS, Physical Chemistry; PhD, Geochemistry
Charles Freshman, BS, Geology; BS, Civil/Environmental Engineering; MS Geological Engineering; PE
Greg Hallsten, BS, Wildlife Biology; BS & MS, Range Management
Wayne Jepson, BS, Earth Sciences; MS, Geology

Warren McCullough, BA, Anthropology; MS Geology
Patrick Plantenberg, BS, Agricultural Science/Recreation Area Management; MS, Range Science/Reclamation Research
Herb Rolfes, Associate degree, Chemical Engineering; BA, Earth/Space Science; MS, Land Rehabilitation

7.0 NEED FOR FURTHER ANALYSIS

DEQ has concluded from the analysis in this draft EA that the Proposed Action would not cause significant impacts to the human environment, and the following agency mitigations are required. Therefore, an EA is the appropriate level of analysis, and no further analysis is needed. DEQ proposes to permit the Proposed Action with mitigations. This is not a final decision. This conclusion may change based on comments received from the public on this Draft EA, new information, or new analysis that may be needed in preparing the Final EA. DEQ proposes to permit the proposed action with the following stipulations.

Proposed mitigations:

1. The Proposed Action would institute a surface subsidence monitoring program prior to commencing mining to measure potential movement of the ground surface. This program includes installation of non-movable points on private and USFS land that would be measured and recorded by survey on a quarterly schedule. Four initial points have been identified to start this program. The points are conceptually located over the main decline, ventilation decline, the spiral portion of the decline, and the ore body in the location of the oxide ore zone/crown pillar backfill (Figure 3). Data would be collected, recorded in a database, and analyzed after each surveying event to monitor potential ground movement or surface subsidence. As a mitigation, the monitoring would be increased to monthly until sufficient depth is reached to allow for a reduction.

2. Surface water and groundwater monitoring would continue as specified in the operational water quality monitoring plan for a period of two years after the completion of reclamation. As a mitigation the monitoring would be continued until it is demonstrated that all applicable water quality standards have been met.

3. A spring survey conducted in late summer 2006 identified two springs in the Study Area (Figure 13): SP-1 is located west of the Project Area in the Turnley Creek drainage; and SP-2 is located in the center of the Project Area near a reclaimed leach pad in the Saddle Facilities Area. Flow from both springs is reported less than 1 gallon per minute (gpm) (Elkhorn Goldfields 2007). Spring SP-1 is included in the ongoing monitoring program (Table 13). As a mitigation, spring SP-2 will be included in the monitoring plan similarly as spring SP-1.

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